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TECHNICAL MEMORANDUM

20 August 2009
File No. 28882-635

TO: Los Angeles Regional Water Quality Control Board
Ana Townsend

C: Boeing Real Property Management
Bob Scott

FROM: Haley & Aldrich, Inc.
Joseph Weidmann

SUBJECT: Resubmittal of Site Closure Evaluation - Parcel A Deep Soil
Former C-6 Facility
Los Angeles, California

Haley & Aldrich, Inc. is resubmitting the Site Closure Evaluation – Parcel A Deep Soils Report (Deep Soil Report) on behalf of Boeing Real Property Management (RPM). This Deep Soil Report is attached as Appendix A on a compact disc and includes the recommendation that a No Further Action (NFA) for commercial/industrial land use be granted by the Los Angeles Regional Water Quality Control Board (LARWQCB) for deep soil at Parcel A of the Former C-6 Facility in Los Angeles, California (Site). The review of this Deep Soil Report was put on hold pending confirmation that the appropriate restrictive covenant (Appendix B) was in place for the property; the LARWQCB recently confirmed that no additional restrictive covenant activities are necessary.

Preceding the original submittal of the Deep Soil Report, which addressed vadose zone soil at depths greater than 12 feet below ground surface (bgs), the LARWQCB granted an NFA for shallow soil ([Shallow Soil NFA]; Appendix C) in response to the Parcel A Post-Demolition Risk Assessment submitted by Integrated Environmental Services, Inc. ([Post-Demolition Report]; Appendix D on compact disc). The Deep Soil Report was prepared to evaluate additional potential exposure pathways not considered in the Post-Demolition Report, including the inhalation of volatile organic compounds (VOCs) in indoor air from upward VOC vapor migration from groundwater into on-Site buildings and VOC migration from deep soil into groundwater and subsequent upward VOC vapor migration from groundwater into indoor air. The Deep Soil Report also evaluated the threat to groundwater quality from residual chemical concentrations in deep soil.

It should be noted that the Deep Soil Report evaluations were performed in accordance with the "Risk Assessment Workplan for Boeing Realty Corporation, Former C-6 Facility," prepared by Ogden Environmental and Energy Services and dated 29 November 2000, and the "Technical Memorandum Risk Assessment Work Plan Addendum No. 1, Boeing Realty Corporation, Former C-6 Facility" prepared by Haley & Aldrich and dated July 11, 2001. Both reports were reviewed and approved by the LARWQCB and the Office of Environmental Health Hazard Assessment (OEHHA) in the

"Approval of Health Risk Assessment Work Plan, Former C-6 Facility, Boeing Realty Corporation, Los Angeles (FILE NO. 95-036)" letter dated 27 September 2002.

Based on the results of the Deep Soil Report, it was recommended that an NFA be granted for deep soil at Parcel A.

Subsequent to the original submittal of the Deep Soil Report to the LARWQCB, VOCs and semi-volatile organic compound (SVOC) concentrations detected in deep soil at boring location PL-B1 were identified during the review of historical reports. These VOC and SVOC concentrations were not included in the evaluations presented in the Post-Demolition Report or the Deep Soil Report; these concentrations were therefore evaluated and the estimated human health risk and potential threat to groundwater evaluation results are summarized herein. The results of this evaluation do not change the conclusions or recommendations included in the Deep Soil Report.

BACKGROUND

Location

Parcel A is within the Former C-6 Facility, located at 19503 South Normandie Avenue, in Los Angeles, California. The approximate location of Parcel A is depicted in Figure 1; a Site plan is presented as Figure 2.

Parcel A Easement Exclusion

An irregular shaped easement adjacent to the northeastern corner of Parcel C and known as the Harborgate Way Easement is excluded from the closure evaluation of Parcel A deep soil. The legal description of the easement is contained in a Declaration of Easements by RPM dated 28 December 1998; its location is shown in Figure 2. The purpose of the easement is to identify the portion of Parcel A deep soil impacts related to sources originating in Parcel C. Shallow soil within the easement received an NFA from the LARWQCB on 21 April 1998. The deep soil VOC impacts in this easement are currently being addressed with a soil vapor extraction (SVE) remediation system as part of the Parcel C Building 1/36 remediation program. The SVE remediation system was approved by the LARWQCB on 16 November 2001. Following completion of SVE remediation operations, the Parcel A Harborgate Way Easement will be included in the deep soil closure request submitted to the LARWQCB for Parcel C.

Land Use History

Aerial photographs indicate that the Site was primarily farmland before the 1940s; its industrial use began in 1941, when it was developed as part of an aluminum reduction plant. The Site was used for warehousing from 1944 to 1952, aircraft manufacturing from 1952 to 1992, and storage between 1992 and 1998. The Site has since been demolished and the property has been redeveloped. Parcel A formerly contained Buildings 34, 36, 37, 61, 44, 45, 57, 67, and the northern portion of Buildings 29 and 58 (Figure 3). Parcel A is currently used by the new owners for commercial purposes.

PREVIOUS ENVIRONMENTAL ACTIVITIES

One Phase I Environmental Site Assessment (Phase I), twelve soil investigations, and thirteen remedial excavations have been performed at Parcel A since 1986, involving approximately 550 soil samples from over 100 borings. Samples were analyzed for VOCs, SVOCs, total petroleum hydrocarbons (TPH), total recoverable petroleum hydrocarbons (TRPH), polychlorinated biphenyls, pesticides, and metals. Figures 4 thru 6 show the locations and key results for deep borings as well as the locations of the excavations. Eleven of the excavations were limited to shallow soil (< 12' bgs) and the remaining two extended to approximately 15 feet bgs. Table I presents detected analytes in deep soil and their maximum detected concentrations. A brief summary of the environmental activities is provided below.

Phase I/Phase II Assessments

Soil investigations started at Parcel A in 1986 with the investigation of underground storage tanks. A Phase I was conducted by Kennedy/Jenks Consultants in 1996. This Phase I identified the following areas of "environmental interest:"

- Areas where chemical impacts had previously been detected;
- Areas with visible surface staining;
- Sump, tank, and clarifier areas; and
- Chemical use and storage areas.

Based on the results of the Phase I, a Phase II soil investigation was conducted at Parcel A. This Phase II identified the following four areas containing concentrations of chemicals that warranted potential concern:

- Building 36;
- The Building 66-1 washdown area;
- North of the Building/Area 45 (near soil borings 1-27 and 1-27A); and
- North of the Building/Area 45 and east of Building 41 (near soil borings SA-NE-14 and SA-NE-17).

The most significant chemicals of concern included trichloroethene (TCE), 1,1-dichloroethene (1,1-DCE), 2-butanone, benzene, and petroleum hydrocarbons. These areas were further characterized and remediated by excavation during Site demolition.

Site Demolition & Post-Demolition Soil Sampling

Soil investigation continued during the demolition of buildings and structures in 1997 and 1998. A grid sampling approach was conducted by partitioning Parcel A into 20-foot by 20-foot grids, screening the soil within each grid node using an organic vapor analyzer (OVA) or a photoionization detector (PID), and then sampling and analyzing each sample with an OVA/PID reading greater than 5 parts per million (ppm). A hot-spot sample approach was then conducted to supplement the grid sampling

approach; hot-spot samples were collected from locations that exhibited either OVA/PID readings greater than 5 ppm, visible soil staining, or noticeable odors.

Health-based remedial goals (HBRGs) were developed by Integrated Environmental Services, Inc.; shallow soils containing chemicals greater than these HBRGs were excavated.

Parcel A Groundwater

Groundwater was investigated under a Site-wide program. Two primary source areas were identified at the Site, the former Building 1/36 area and the former Building 2 area in Parcel C. TCE and 1,1-DCE were the most significant chemicals detected in groundwater beneath Parcel A, but appear related to the migration of Parcel C groundwater impacts. As discussed below, no significant sources for impacts to groundwater were identified in Parcel A. Closure of groundwater will be requested under separate cover after completion of the Site-wide groundwater remediation program.

RISK EVALUATIONS

Two risk evaluation efforts were performed for Parcel A as presented in the Post-Demolition and Deep Soil Reports. The Post-Demolition Report considered ingestion and dermal contact of impacted soil, inhalation of ambient air, and inhalation of indoor air due to potential subsurface migration into buildings from soil impacts for an on-Site construction and an on-Site commercial/industrial worker, as well as an off-Site commercial/industrial worker and an off-Site resident child/adult (Figure 7). It should be noted that the evaluation of risk from potential vapor intrusion included potential migration from impacts within the entire vadose zone. The calculated risk levels (Figure 8) were deemed acceptable to the Department of Toxic Substance Control and the LARWQCB as indicated in the Shallow Soil NFA, and were less than the OEHHA-approved acceptable risk thresholds.

The Deep Soil Report calculated the additional risks of the inhalation of indoor air due to potential subsurface migration from current and potential future groundwater impacts into indoor air for an on-Site commercial/industrial worker, and then added these risks to the previously estimated risks. These updated cumulative risks (Figure 9) did not result in risks greater than OEHHA-approved acceptable risk thresholds.

The Deep Soil Report also evaluated the potential degradation of groundwater quality due to chemical leaching from deep soil to groundwater. The evaluation involved calculating Site-specific soil screening levels (SSLs) using the LARWQCB guidance and California drinking water standards (MCLs). The results indicated that the existing residual chemical concentrations in Parcel A deep soil do not pose a threat to groundwater quality at levels greater than MCLs, with the potential exception of 1,1-DCE and TCE in several isolated locations. These locations are highlighted in Figure 6 and listed below:

- TCE (0.120 and 0.110 mg/kg) at depths of 40 and 50 feet bgs in borings NE-2/2BB-NE-2;
- TCE (0.200 and 0.150 mg/kg) at depths of 25 and 30 feet bgs in borings 15/B-15-FS;
- 1,1-DCE (0.120 mg/kg) at a depth of 50 feet bgs in boring 1-23; and

- TCE (up to 0.120 mg/kg) and 1,1-DCE (up to 0.350 mg/kg) at depths of 40 and/or 50 feet bgs in borings 1-6/2BB-1-6.

Available representative boring logs are presented in Appendix E; the tables of SSL values are included in Appendix F:

The above noted concentrations of TCE and 1,1-DCE are localized and less than two times greater than the SSLs. Since the SSLs are derived on conservative assumptions, the concentrations do not appear to pose a significant threat to groundwater quality beneath Parcel A. Additionally, many of the concentrations may be related to groundwater impact/capillary fringe effects and/or are located in fine-grained soils (which have a low potential for migration). Furthermore, VOC concentrations at each of these locations, with the exception of boring 15/B-15-FS, are expected to be reduced by the operation of the nearby Building 1/36 SVE remediation system, which extends into the Parcel A Harborgate Way Easement. The concentrations at 15/B-15-FS appear to be related to apparent releases from a former hazardous waste accumulation area, which was excavated to a depth of at least 12 feet bgs.

As stated previously, the VOC and SVOC concentrations detected in boring PL-B1 (Figure 10) were not included in the evaluations presented in the Post-Demolition Report or the Deep Soil Report. It is noted that this boring was advanced in an area that was excavated to at least 12 feet bgs and was documented in the document titled "Soil Boring Report, Parcel A," prepared by Montgomery Watson, and dated March 1998. The concentrations detected in PL-B1 were evaluated using the same methodology presented in the Deep Soil Report; the associated revised calculations are included in Appendix F.

Based on these calculations, the concentrations detected in PL-B1, when added to previously estimated risks, do not result in risks greater than OEHHA-approved acceptable risk thresholds (Figure 11). These concentrations are also below their associated SSLs and do not appear to pose a significant threat to groundwater quality beneath Parcel A (Appendix F).

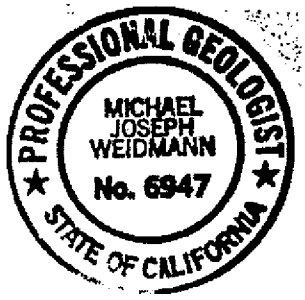
CONCLUSION

Based on this evaluation, we continue to recommend that an NFA be granted for deep soil at Parcel A.

Please do not hesitate to call if you have any questions or comments.

Sincerely yours,
HALEY & ALDRICH, INC.

FSL:
Joseph Weidmann
Senior Geologist PG No. 6947



for
Anita Broughton, REA, EIT, CIH
Vice President

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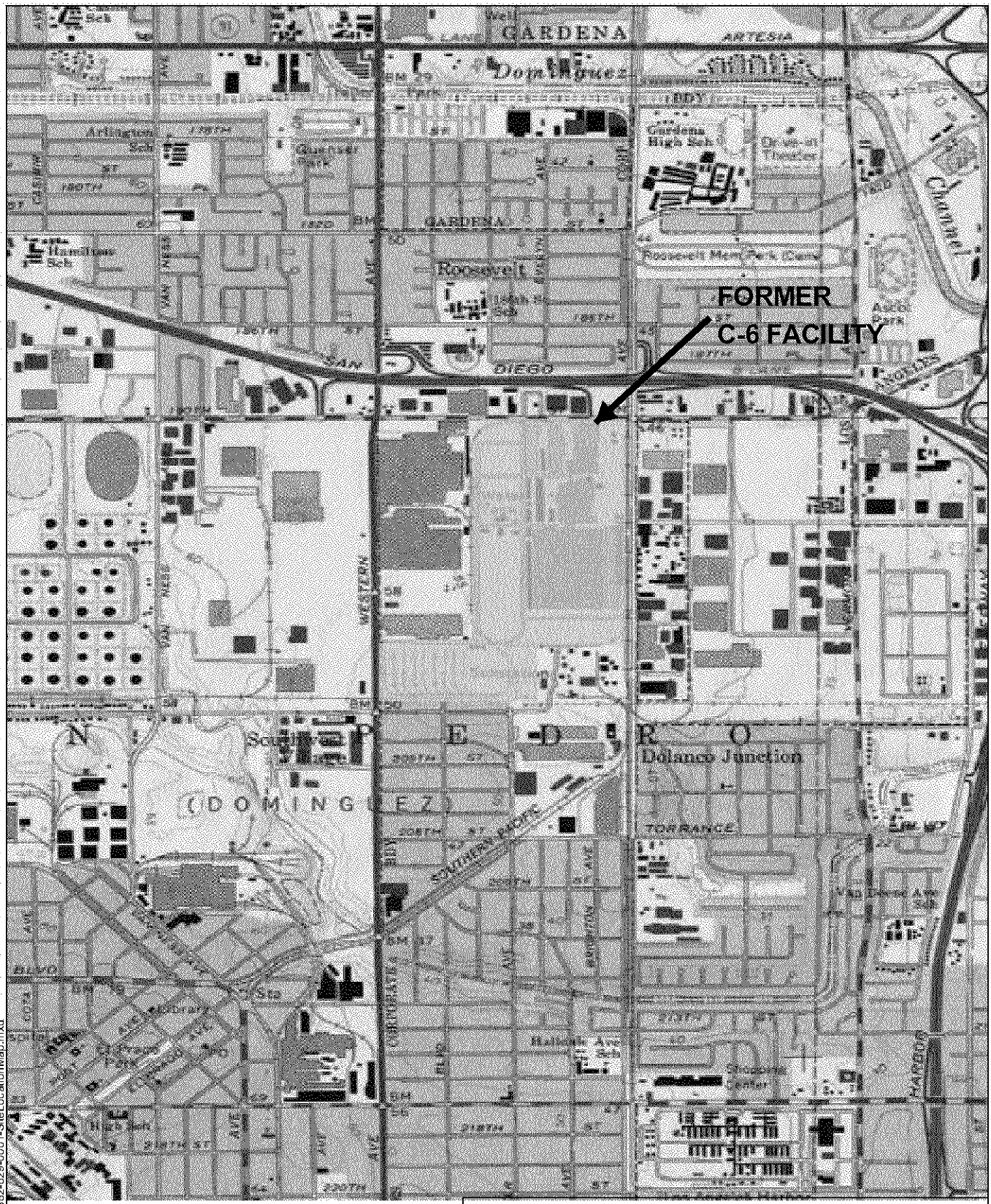
Attachments:

Table I - Table I - Maximum Concentrations in Deep Soil (12.5 to 55 Feet bgs)
Figure 1 – Site Location Map
Figure 2 – Parcel A Site Plan
Figure 3 – Douglas Aircraft Company C-6 Facility Soil Boring Location Map
Figure 4 – Parcel A SVOC and PCB Concentrations in Soil Greater than 12.5 Feet bgs
Figure 5 – Parcel A TPH and TRPH Concentrations in Soil Greater than 12.5 Feet bgs
Figure 6 – Parcel A VOC Concentrations in Soil Greater than 12.5 Feet bgs
Figure 7 – Conceptual Exposure Model (CEM), Post-Demolition Parcel A
Figure 8 – Summary of Post-Demolition Health Risk, C-6 Facility, Parcel A
Figure 9 – Summary of Cumulative Risks
Figure 10 – PL-B1 and Surrounding Soil Data
Figure 11 – Summary of Cumulative Risks Including Boring PL-B1
Appendix A – Site Closure Evaluation - Parcel A Deep Soil, Haley & Aldrich, Inc., April 22, 2002 (on Compact Disc)
Appendix B – Declaration of Restrictive Covenants
Appendix C – No Further Action for Shallow Soil in Parcel A, Boeing Realty Corporation (BRC) C-6 Facility, 19503 South Normandie Avenue, Los Angeles (SLIC No. 410)
Appendix D – Parcel A Post-Demolition Risk Assessment, Integrated Environmental Services, Inc., March 1998 (on Compact Disc)
Appendix E – Boring Logs
Appendix F – Parcel A Soil Screening Levels and Risk Calculations

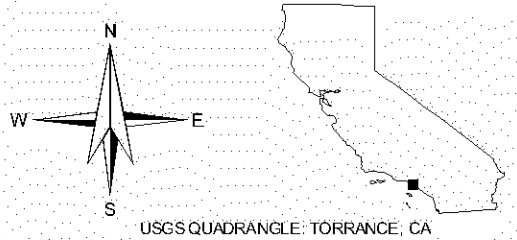
TABLE I
MAXIMUM CONCENTRATIONS IN DEEP SOIL (12.5 TO 55 FEET BGS)
FORMER C-6 FACILITY - PARCEL A
LOS ANGELES, CALIFORNIA

Analyte	Depth Feet BGS	Maximum Concentration Detected	Units
1,1,1-Trichloroethane	50	15	ug/kg
1,1,2-Trichloroethane	20	18	ug/kg
1,1-Dichloroethane	25	60	ug/kg
1,1-Dichloroethene	40	350	ug/kg
1,2,4-Trimethylbenzene	20	45000	ug/kg
1,2-Dichloroethane	20	8.7	ug/kg
1,3,5-Trimethylbenzene	20	15000	ug/kg
2-Methylnaphthalene	20	250000	ug/kg
Acenaphthene	20	6500	ug/kg
Aluminum	25	30600	mg/kg
Anthracene	20	7400	ug/kg
Aroclor 1248	15	130	ug/kg
Arsenic	50	23	mg/kg
Barium	15	220	mg/kg
Benzo(a)anthracene	20	11000	ug/kg
Benzo(a)pyrene	20	13000	ug/kg
Benzo(g,h,i)perylene	20	7800	ug/kg
Beryllium	25	0.92	mg/kg
bis(2-Ethylhexyl) phthalate	20	2300	ug/kg
Cadmium	23	0.59	mg/kg
Chloroform	50	1.6	ug/kg
Chromium	50	51	mg/kg
Chrysene	20	22000	ug/kg
cis-1,2-Dichloroethene	20	43	ug/kg
Cobalt	12.5	75	mg/kg
Copper	13	54.5	mg/kg
Ethyl benzene	20	5000	ug/kg
Fluoranthene	20	5700	ug/kg
Fluorene	20	16000	ug/kg
Lead	25	9	mg/kg
Mercury	20	0.48	mg/kg
Molybdenum	50	0.6	mg/kg
Naphthalene	20	120000	ug/kg
n-Butylbenzene	20	3100	ug/kg
Nickel	15	36	mg/kg
n-Propylbenzene	20	2500	ug/kg
Phenanthrene	20	73000	ug/kg
Pyrene	20	51000	ug/kg
Selenium	18	0.69	mg/kg
Tetrachloroethene	25	202	ug/kg
Thallium	20	0.91	mg/kg
Toluene	40	690	ug/kg
Trichloroethene	25	200	ug/kg
TRPH	20	1132	mg/kg
Vanadium	25	74.7	mg/kg
Xylenes, Total	30	28000	ug/kg
Zinc	15	126	mg/kg

NOTES:
BGS = Below Ground Surface
mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram



SITE COORDINATES : 118° 18 '08.8" W 33° 51' 10.9" N



USGS QUADRANGLE: TORRANCE, CA

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BOEING CORPORATE REAL ESTATE
FORMER C-6 FACILITY
19503 S. NORMANDIE AVE.
LOS ANGELES, CALIFORNIA

SITE LOCATION MAP

SCALE: 1:24,000

FIGURE 1

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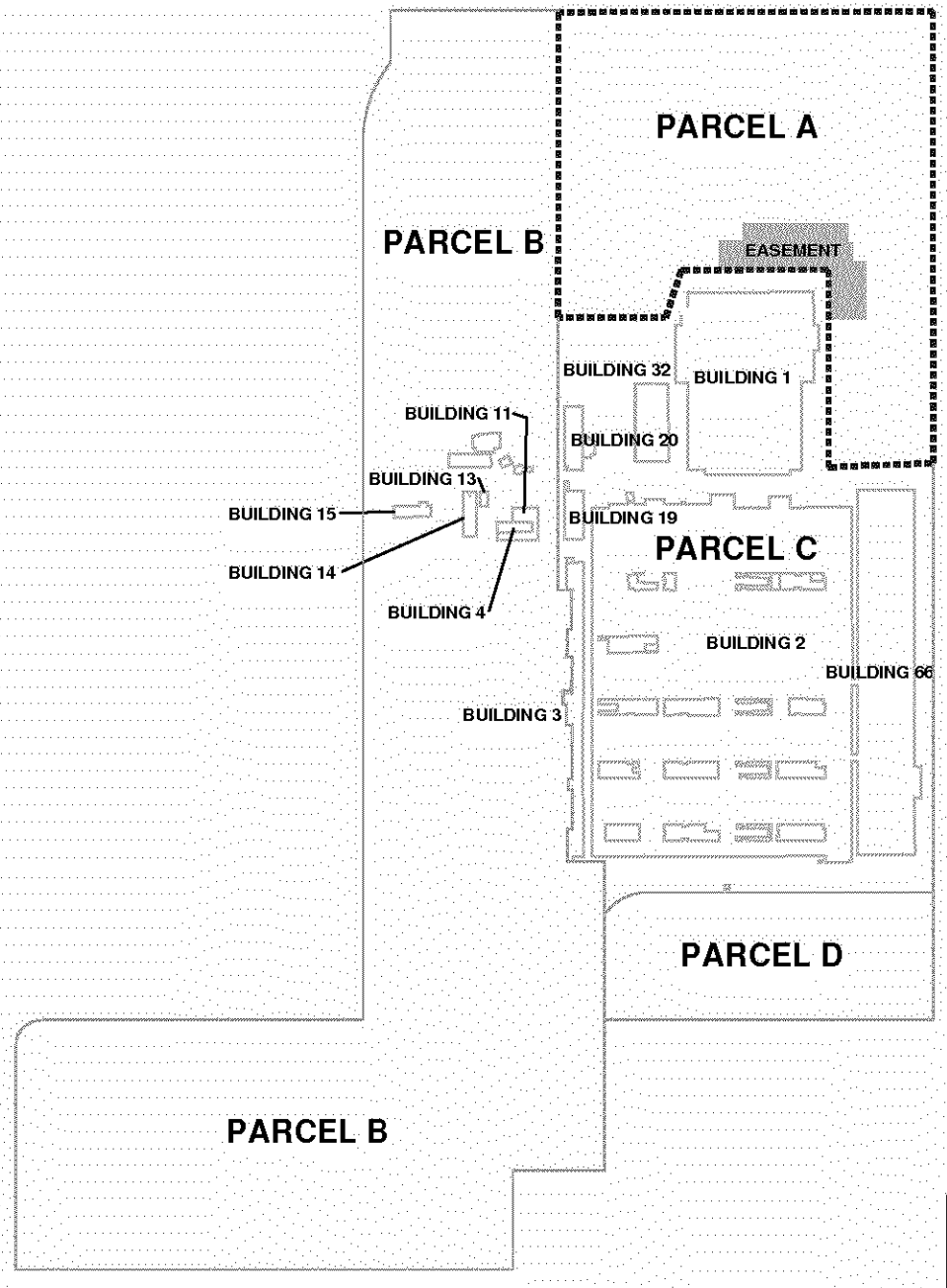

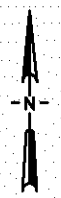

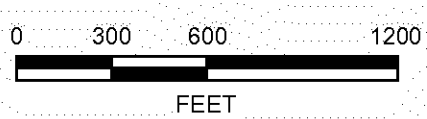

SOURCE: Kennedy/Jenks Consultants, Sampling & Analysis Plan, Boeing Realty Corporation's C-6 Facility-Parcel C, Los Angeles, California, 15 August, 2000

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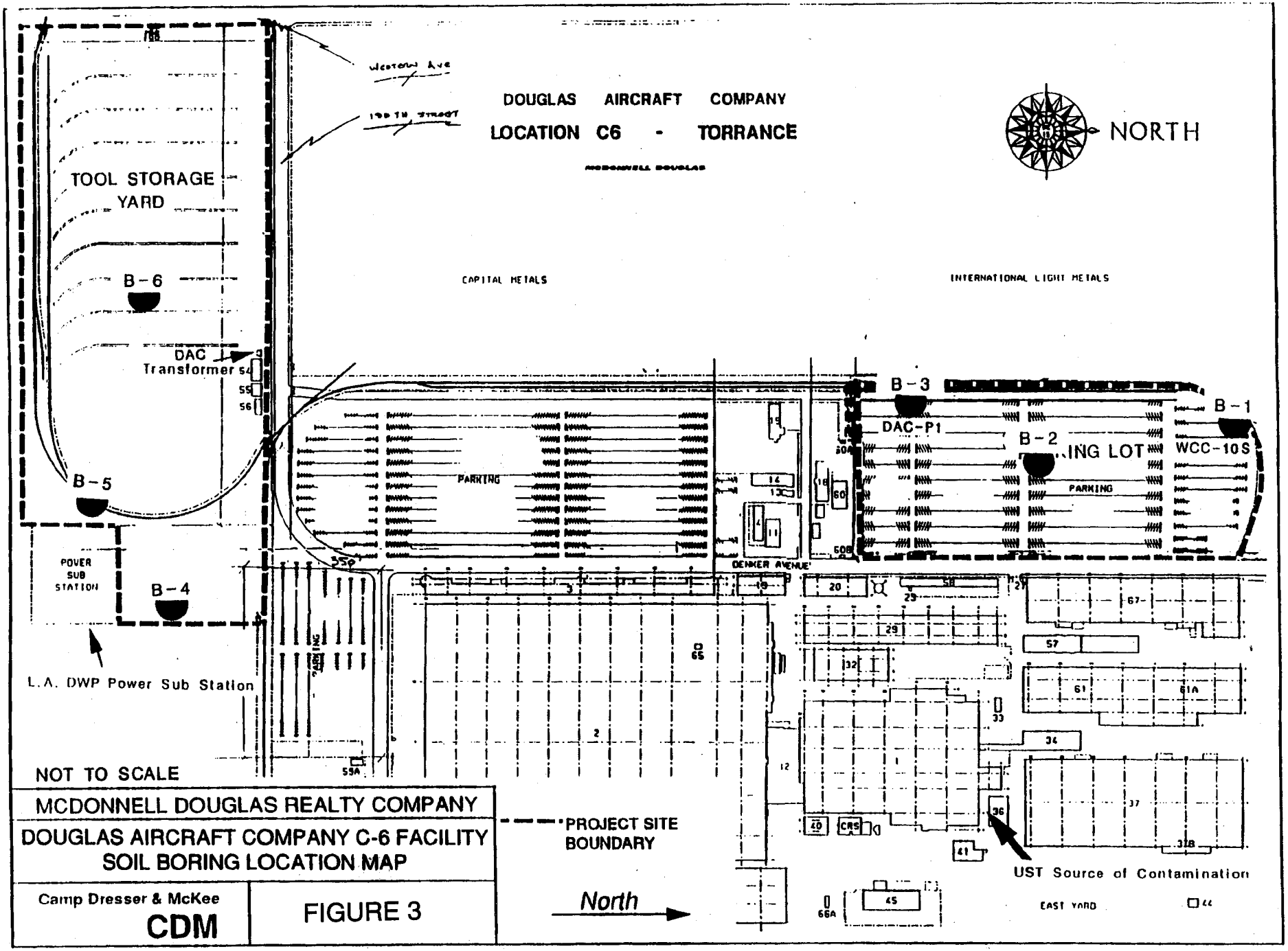
BOEING REALTY CORPORATION
FORMER C-6 FACILITY
LOS ANGELES, CALIFORNIA

FIGURE: 2

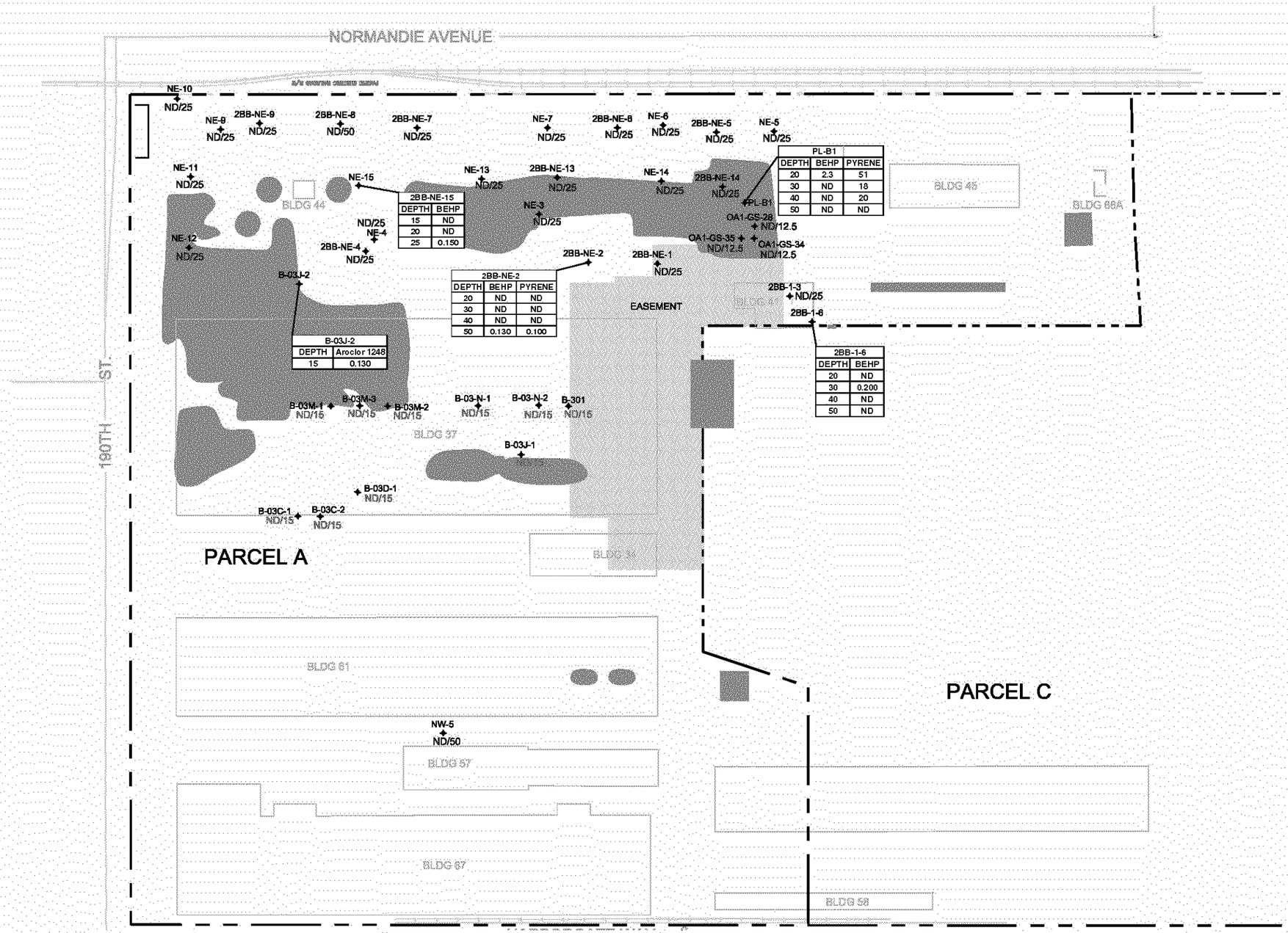
PARCEL A SITE PLAN

SCALE: AS SHOWN		PROJECT: 27285-002
DRAWN: SAL	REVIEWED: RLM	DATE: 22 APRIL 2002

BOE-C6-0058773



This Figure taken from the Phase II Environmental Assessment of the Douglas Aircraft Company C-6 Facility, Parking Lot and Tool Storage Yard, Los Angeles, CA, Camp Dresser & McKee Inc., August 21, 1991



2BB-NE-15	
DEPTH	BEHP
15	ND
20	ND
25	0.150

PL-B1		
DEPTH	BEHP	PYRENE
20	2.3	51
30	ND	18
40	ND	20
50	ND	ND

2BB-NE-2		
DEPTH	BEHP	PYRENE
20	ND	ND
30	ND	ND
40	ND	ND
50	0.130	0.100

B-03J-2	
DEPTH	Aroclor 1248
15	0.130

2BB-1-6	
DEPTH	BEHP
20	ND
30	0.200
40	ND
50	ND

LEGEND

- 2BB-1-21 ✦ SOIL BORING LOCATION
- PARCEL BOUNDARY
- BUILDING FOOTPRINTS (FORMER)
- ND/25 BIS (2-ETHYLHEXEL) PHTHALATE AND PYRENE (mg/kg) LESS THAN METHOD DETECTION LIMIT IN ALL SAMPLES UNLESS OTHERWISE INDICATED / TOTAL DEPTH OF BORING
- ND/25 AROCLOR 1248 (mg/kg) LESS THAN METHOD DETECTION LIMIT IN ALL SAMPLES UNLESS OTHERWISE INDICATED / TOTAL DEPTH OF BORING
- EASEMENT INCLUDED WITH PARCEL C CLOSURE
- EXCAVATION

NOTES:

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE
2. ALL CONCENTRATIONS UNITS EXPRESSED AS mg/Kg (MILLIGRAMS PER KILOGRAM)
3. BGS: BELOW GROUND SURFACE
4. DEPTH IN FEET
5. CONCENTRATIONS OF SVOCs AND PCBs WITH CALCULATED SOIL SCREENING LEVELS ARE PRESENTED ON THIS FIGURE
6. FIGURE UPDATED IN JULY 2009 TO INCLUDE BORINGS PL-B1 AND 2BB-NE-14.

N

0 40 80 160
FEET

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FORMER C-6 FACILITY
LOS ANGELES, CALIFORNIA

FIGURE: 4

PARCEL A SVOC & PCB CONCENTRATIONS IN SOIL GREATER THAN 12 FEET BGS

SCALE: AS SHOWN | PROJECT: 27285-002
DRAWN: SAL | REVIEWED: MM | DATE: UPDATED JULY 2009

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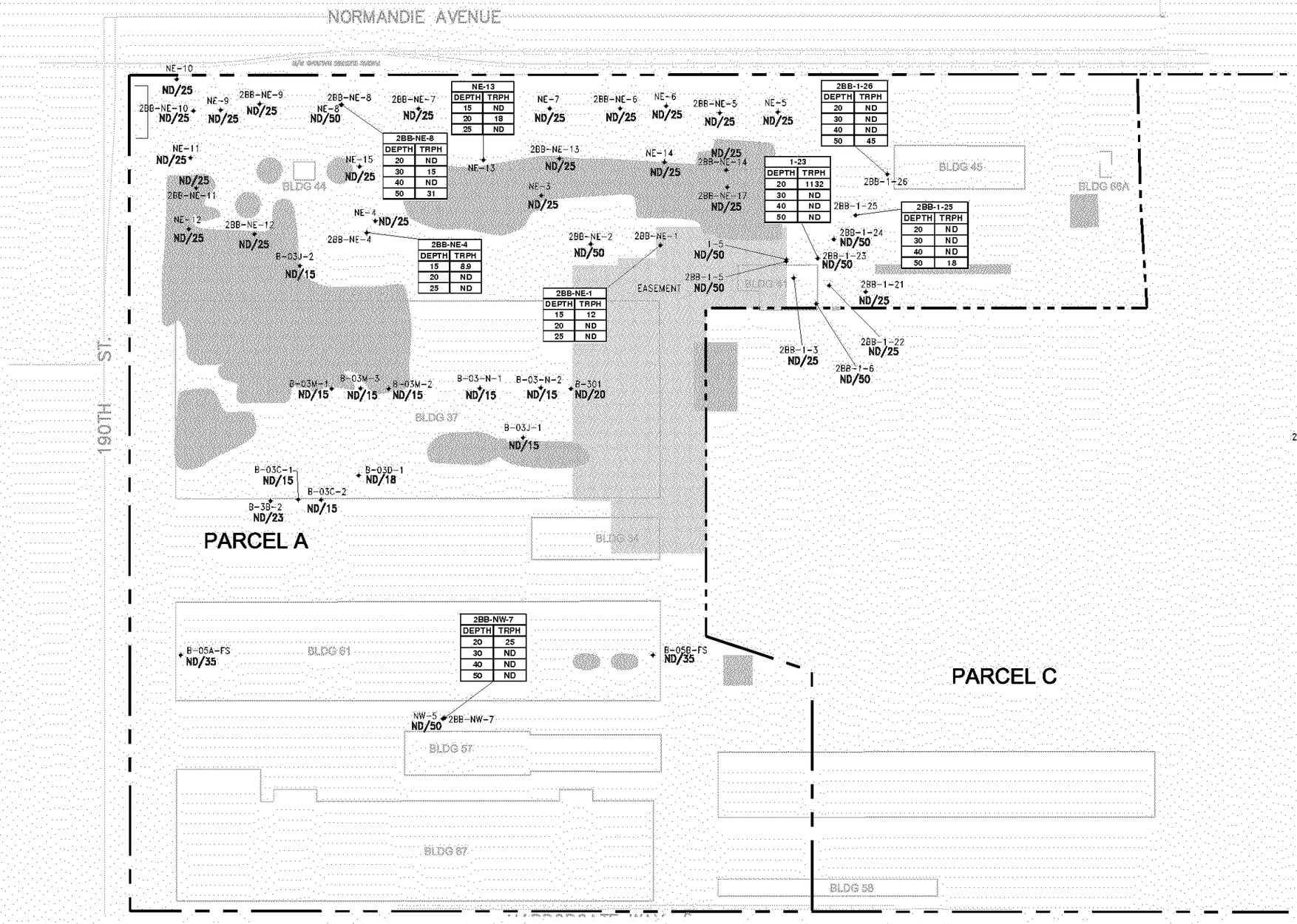
This Figure taken from the Site Closure Evaluation Parcel A Deep Soils, Haley & Aldrich, Inc., April 22, 2002



LEGEND

- 2BB-1-21 — SOIL BORING LOCATION
- PARCEL BOUNDARY
- BUILDING FOOTPRINTS (FORMER)
- ND/25 — TRPH LESS THAN METHOD DETECTION LIMIT IN ALL SAMPLES UNLESS OTHERWISE INDICATED / TOTAL DEPTH OF BORING
- TRPH — TOTAL RECOVERABLE PETROLEUM HYDROCARBONS
- REMEDIATION EASEMENT INCLUDED WITH PARCEL C CLOSURE
- EXCAVATION

NOTE: ALL CONCENTRATIONS UNITS EXPRESSED AS (mg/kg)
DEPTH IN FEET

N

0 40 80 160
FEET

ALL DIMENSIONS AND LOCATIONS APPROXIMATE

(002) 2725055

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LOS ANGELES, CALIFORNIA

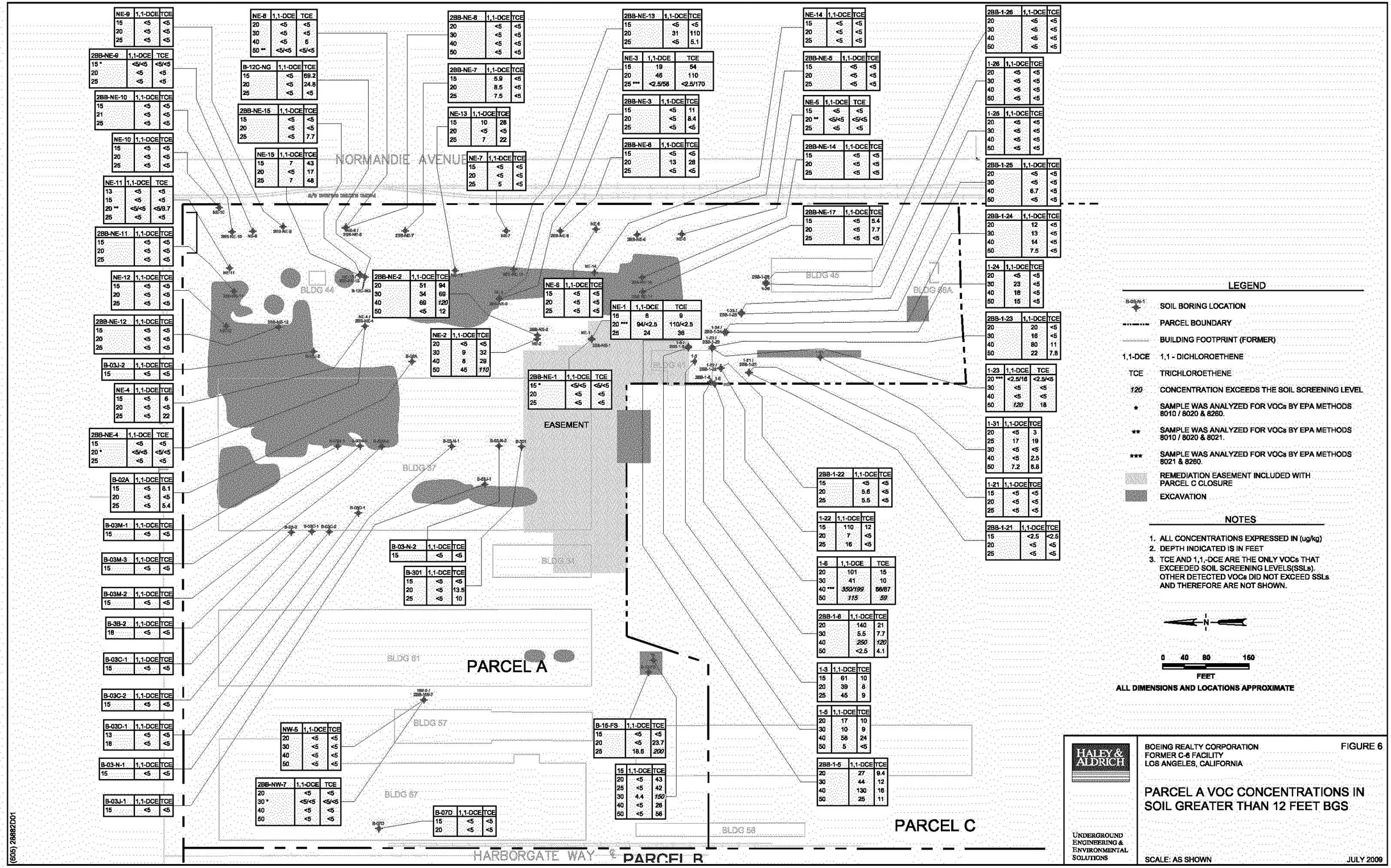
FIGURE 5

PARCEL A TRPH CONCENTRATIONS IN SOIL GREATER THAN 12 FEET BGS

SCALE: AS SHOWN

OCTOBER 2003

This Figure taken from the Site Closure Evaluation Parcel A Deep Soils, Haley & Aldrich, Inc., April 22, 2002



This Figure taken from the Site Closure Evaluation Parcel A Deep Soils, Haley & Aldrich, Inc., April 22, 2002

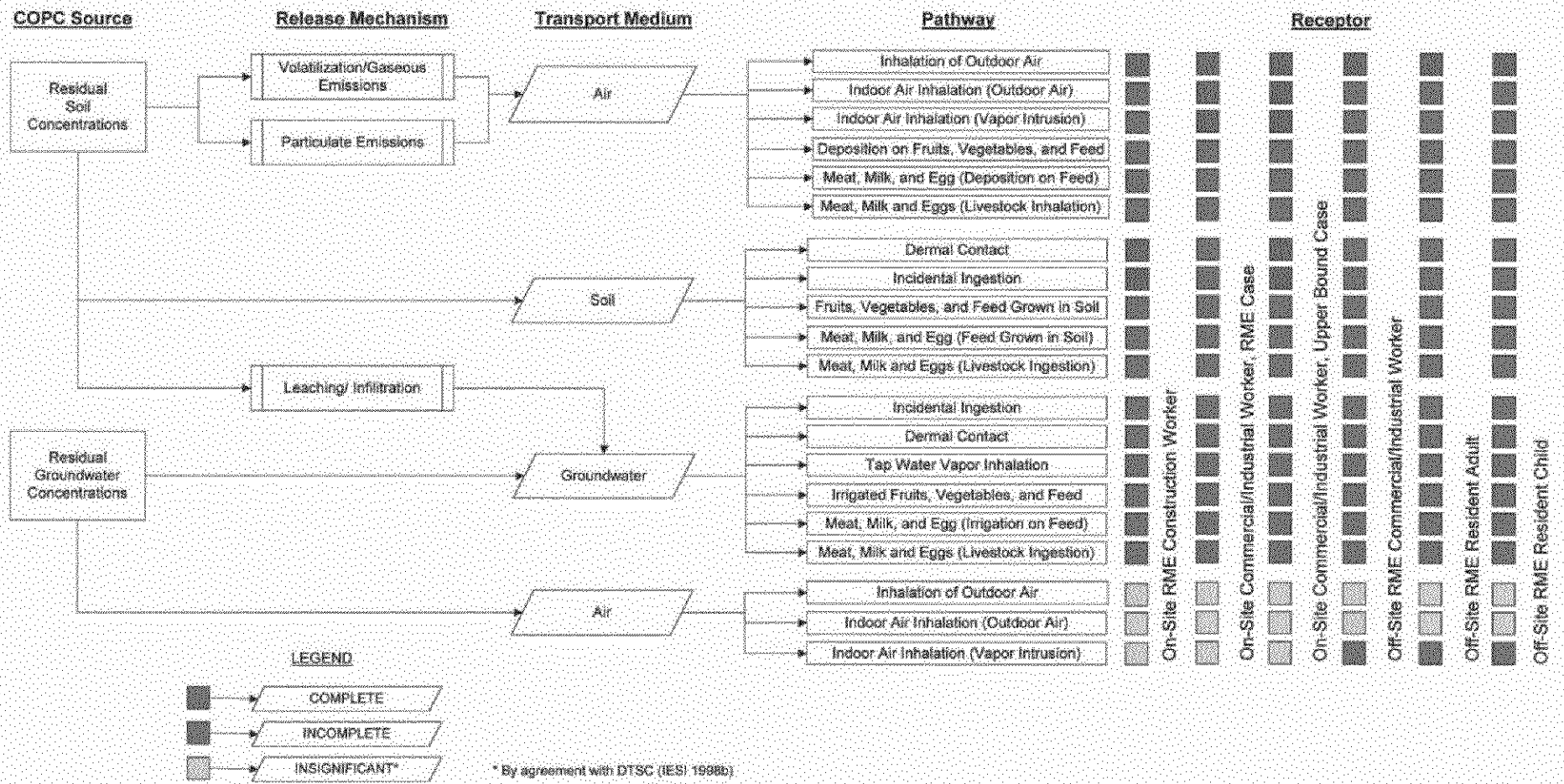


FIGURE 7
CONCEPTUAL EXPOSURE MODEL (CEM), POST-DEMOLITION PARCEL A

This Figure taken from the Parcel A Post-Demolition Risk Assessment, Integrated Environmental Services, Inc., March 1998

FIGURE 8
SUMMARY OF POST-DEMOLITION HEALTH RISK, C-6 FACILITY, PARCEL A

On-Site Receptors	HI	ILCR
AOPC 1		
Construction Worker	5.1E-02	1.4E-06
Commercial/Industrial Worker, RME[a]	6.4E-05	1.2E-10
Commercial/Industrial Worker, Upper Bound[b]	4.6E-03	4.4E-06
AOPC 2		
Construction Worker	1.5E-02	7.7E-07
Commercial/Industrial Worker, RME[a]	8.7E-05	1.7E-10
Commercial/Industrial Worker, Upper Bound[b]	1.0E-03	2.5E-06
Off-Site Receptors	**HI**	**ILCR**
Commercial/Industrial Worker	2.5E-05	5.2E-11
Resident Adult	1.2E-06	2.9E-12
Resident Child	5.5E-06	2.7E-12

[a]Reasonable Maximum Exposure conditions, assumes 2-foot layer of clean fill.
[b]Upper Bound exposure conditions, assumes no layer of fill.
AOPC = Area of Potential Concern
HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk

FIGURE 9 - Summary of Cumulative Risks

	Onsite Construction Worker (Highest of AOPC 1 and AOPC 2)	Onsite Commercial/Industrial Worker (Highest of AOPC 1 and AOPC 2)	Onsite DTSC Commercial/Industrial Worker (Highest of AOPC 1 and AOPC 2)
Hazard Index			
Previously Estimated	0.051	0.000087	0.005
Vapor Migration from Groundwater	NA	0.0024	0.0024
Vapor Migration from Deep Soil			
Leachate and Subsequent			
Volatilization from Groundwater	NA	0.00018	0.00018
Total	0.051	0.0026	0.0072
Excess Cancer Risk			
Previously Estimated	1.4E-06	1.7E-10	4.4E-06
Vapor Migration from Groundwater	NA	2.9E-06	2.9E-06
Vapor Migration from Deep Soil			
Leachate and Subsequent			
Volatilization from Groundwater	NA	1.8E-07	1.8E-07
Total	1.4E-06	3.1E-06	7.5E-06

NA = Not applicable

AOPC = Area of Potential Concern (Two areas of potential concern were identified for Parcel A in the post-demolition risk assessment.)

This Figure taken from the Site Closure Evaluation Parcel A Deep Soils, Haley & Aldrich, Inc., April 22, 2002

PARCEL A

PD-24	20	25	30	40	50	60
1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	7	21
1,1-DICHLOROETHANE	ND	ND	ND	ND	2.4 J	5.8
1,1-DICHLOROETHENE	ND	65	31	71	98	260
TRANS-1,2-DICHLOROETHENE	ND	ND	ND	ND	4.3 J	7.4
CIS-1,2-DICHLOROETHENE	ND	ND	ND	ND	ND	4.1 J
TRICHLOROETHENE	ND	46	25	62	100	160
BENZENE	ND	ND	ND	ND	2.7 J	4.3 J
CHLOROFORM	ND	ND	ND	ND	1.6 J	3.4 J

2BB-NE-1	20	25
VOCs	ND	ND
SVOCs	ND	ND

NE-1	20	25
1,1-DICHLOROETHENE	94	24
TRICHLOROETHENE	110	36
SVOCs	ND	ND

NE-14	20	25
VOCs	ND	ND
SVOCs	ND	ND

NE-6	20	25
VOCs	ND	ND
SVOCs	ND	ND

1-4	20	30	40	50
1,1-DICHLOROETHENE	ND	30	30	130
CIS-1,2-DICHLOROETHENE	23	32	7	9
TRICHLOROETHENE	ND	18	15	48
SVOCs	ND	ND	ND	ND

2BB-NE-5	20	25
VOCs	ND	ND
SVOCs	ND	ND

2BB-1-4	20	30	40	50
1,1,1-TRICHLOROETHANE	ND	ND	ND	5.9
1,1-DICHLOROETHENE	39	59	82	98
CIS-1,2-DICHLOROETHENE	56	45	16	ND
TRICHLOROETHENE	27	52	48	54
SVOCs	ND	ND	ND	ND

1-3	20	25
1,1-DICHLOROETHENE	39	45
TRICHLOROETHENE	8	9
SVOCs	ND	ND

NE-5	20	25
VOCs	ND	ND
SVOCs	ND	ND

1-5	20	30	40	50
1,1-DICHLOROETHENE	17	10	58	5
TRICHLOROETHENE	10	9	24	ND
SVOCs	ND	ND	ND	ND

2BB-NE-14	20	25
VOCs	ND	ND
SVOCs	ND	ND

2BB-NE-17	20	25
TRICHLOROETHENE	7.7	ND

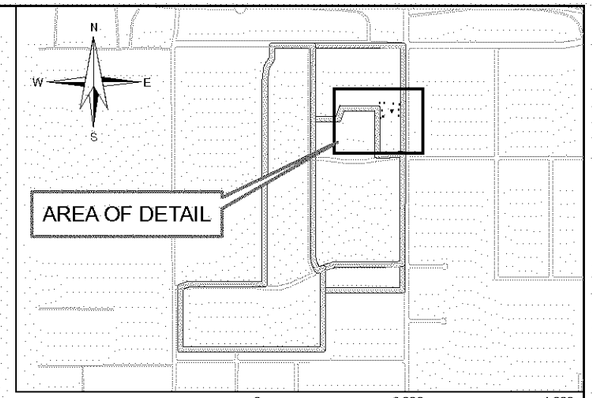
PL-B1	20	30	40	50
1,2,4-TRIMETHYLBENZINE	45,000	42,000	19,000	ND
1,3,5-TRIMETHYLBENZENE	15,000	14,000	5,900	ND
ETHYLBENZENE	5,000	2,000	1,400	ND
n-BUTYLBENZENE	3,100	2,500	1,300	ND
n-PROPYLBENZENE	2,500	1,400	910	ND
NAPHTHALENE	120,000	110,000	36,000	ND
XYLENES, TOTAL	12,000	28,000	12,000	ND
2-METHYLNAPHTHALENE	250,000	100,000	95,000	ND
ACENAPHTHENE	6,500	2,700	ND	ND
ANTHRACENE	7,400	3,200	3,300	ND
BENZO(a)ANTHRACENE	11,000	3,400	4,200	ND
BENZO(a)PYRENE	13,000	ND	ND	ND
BENZO(ghi)PYRENE	7,800	ND	ND	ND
BIS(2-ETHYLEXYL) PHTHALATE	2,300	ND	ND	ND
CHRYSENE	22,000	7,500	7,500	ND
FLUORANTHENE	5,700	ND	ND	ND
FLUORENE	16,000	6,300	6,400	ND
PHENANTHERENE	73,000	28,000	29,000	ND
PYRENE	51,000	18,000	20,000	ND
TOLUENE	ND	ND	690	ND

PARCEL C

2BB-1-5	20	30	40	50
1,1-DICHLOROETHENE	27	44	180	25
TRICHLOROETHENE	9.4	12	33	11
SVOCs	ND	ND	ND	ND

PD-24 NE-1 2BB-NE-1 NE-14 NE-6 1-4 2BB-1-4 2BB-NE-5 2BB-NE-17 2BB-NE-14 PL-B1 1-5 2BB-1-5 1-3 NE-5

NORMANDIE STREET



SITE PLAN

0 2,000 4,000

SCALE IN FEET

LEGEND

- SOIL SAMPLE LOCATION
- PARCEL BOUNDARY
- EXCAVATION LIMIT

SAMPLE IDENTIFICATION

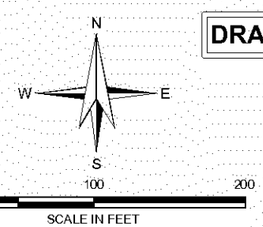
NE-1	20	25
1,1-DICHLOROETHENE	94	24
TRICHLOROETHENE	110	36
SVOCs	ND	ND

ANALYTE

DEPTH IN FEET BELOW GROUND SURFACE (bgs)

CONCENTRATION IN ug/Kg (Micrograms per Kilogram)

NOTES:
- ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
- EXCAVATION LIMITS BASED ON MONTGOMERY WATSON REPORT (1998).
- AREA EXCAVATED TO APPROXIMATELY 12 FEET BGS AND CONFIRMATION SOIL SAMPLES COLLECTED AT BOTTOM OF EXCAVATION.



DRAFT

HALEY & ALDRICH

BOEING CORPORATE REAL ESTATE
FORMER C-6 FACILITY
LOS ANGELES, CALIFORNIA

PL-B1 AND SURROUNDING SOIL DATA

SCALE: AS SHOWN
JULY 2008

FIGURE 10

G:\28882 C-6\623\GIS\Map Projects\28882-628.0001 Boring Data.mxd

BOE-C6-0058781

FIGURE 11
SUMMARY OF CUMMULATIVE RISK INCLUDING BORING PL-B1
FORMER C-6 FACILITY, PARCEL
LOS ANGELES, CALIFORNIA

	Onsite Construction Worker (Highest of AOPC 1 and AOPC 2)	Onsite Commercial/Industrial Worker (Highest of AOPC 1 and AOPC 2)	Onsite DTSC Commercial/Industrial Worker (Highest of AOPC 1 and AOPC 2)
Hazard Index			
Previously Estimated	0.051	0.000087	0.0046
Vapor Migration from Groundwater	NA	0.0024	0.0024
Vapor Migration from Deep Soil	NA	0.075	0.075
Vapor Migration from Deep Soil Leachate and Subsequent Volatilization from Groundwater	NA	0.0082	0.0082
Total	0.051	0.086	0.090
Excess Cancer Risk			
Previously Estimated	1.4E-06	1.7E-10	4.4E-06
Vapor Migration from Groundwater	NA	2.9E-06	2.9E-06
Vapor Migration from Deep Soil	NA	NA	NA
Vapor Migration from Deep Soil Leachate and Subsequent Volatilization from Groundwater	NA	7.0E-08	7.0E-08
Total	1.4E-06	3.0E-06	7.4E-06

NA = Not applicable
AOPC = Area of Potential Concern (Two areas of potential concern were identified for Parcel A in the post-demolition risk assessment.)

Appendix A

Site Closure Evaluation - Parcel A Deep Soil, Haley & Aldrich, Inc., April 22, 2002
(on Compact Disc)

HALEY & ALDRICH

22 April 2002
File No. 27285-003

Mr. Brian Mossman
Boeing Realty Corporation
3855 Lakewood Blvd.
Building 1A MC D001-0097
Long Beach, California 90846

Subject: **Site Closure Evaluation - Parcel A Deep Soil, Boeing Realty Corporation (BRC) Former C-6 Facility, Los Angeles, California**

Dear Mr. Mossman:

Haley & Aldrich, Inc. (Haley & Aldrich) has conducted an evaluation for recommended closure of deep soil (vadose zone soil at depths greater than 12 feet below ground surface [bgs]) at the subject property (Parcel A). Parcel A is one of four parcels (Parcels A through D) of the BRC Former C-6 Facility (Facility), at 19503 South Normandie Avenue, in Los Angeles, California (Figures 1 & 2). This evaluation includes all areas of Parcel A with the exception of the Harborgate Way Easement which is included in the Parcel C closure program (Figure 2).

EXECUTIVE SUMMARY

BRC has completed their investigation and risk assessment evaluation of deep soil within Parcel A. These activities included:

- Investigation of the vertical and lateral extent of soil impacts
- Investigation of impacts to groundwater
- Groundwater monitoring for the presence of volatile organic compounds (VOCs)
- Preparation of risk assessment work plans
- Evaluation of the potential for adverse health effects from residual soil and groundwater impacts
- Evaluation of the potential impacts on groundwater quality from residual soil impacts

Based on the closure evaluation presented herein, it is recommended that the Regional Water Quality Control Board – Los Angeles Region (RWQCB) issue a "no further action" letter for deep soil impacts in Parcel A based on the following information and conclusions:

1. Both the vertical and lateral extent of soil impacts related to onsite operations have been delineated.

2. In a letter dated April 21, 1998 (RWQCB 1998), the RWQCB issued a letter of no further action for shallow soil in Parcel A. The RWQCB also indicated that the California Human and Ecological Risk Division (HERD) agreed with the conclusion in the post-demolition risk assessment and that residual shallow soil impact risks fall within a range of values that HERD determines to be acceptable for the proposed land use, and the impact risks will not pose significant health risks for future site occupants.

3. The following additional potential exposure pathways were evaluated using deep soil investigation results:

   - inhalation of VOCs in indoor air from upward VOC vapor migration from groundwater into onsite buildings, and

   - inhalation of VOCs in indoor air due to VOC migration from deep soil leachate to groundwater and subsequent upward VOC vapor migration from groundwater into indoor air.

   Deep soil does not pose a risk to human health greater than acceptable levels from inhalation of VOCs from upward VOC vapor migration into onsite buildings. No other exposure pathways are considered complete for deep soil.

   Adding the estimated risks for Parcel A from the above-listed pathways to the risks calculated for potential on-site receptors, as presented in the post-demolition risk assessment, do not result in risks greater than the Office of Environmental Health Hazard Assessment (OEHHA)-approved acceptable risk levels for the BRC Former C-6 Facility property.

4. The existing residual chemical concentrations in Parcel A deep soil do not pose a threat to groundwater quality at levels greater than MCLs, with the potential exception of 1,1-DCE and TCE. Comparison of these estimated maximum VOC concentrations in groundwater, due to leaching, to measured VOC concentrations in groundwater indicates that existing concentrations in soil will not further degrade existing groundwater quality.

1.0 BACKGROUND

1.1 SITE LOCATION

Parcel A is located within the BRC Former C-6 Facility at 19503 South Normandie Avenue, in Los Angeles, California. The approximate location of Parcel A is depicted in Figure 1. A site plan is presented as Figure 2.

1.2 SITE LAND USE HISTORY

Parcel A occupies approximately 50 acres in the northern portion of the Facility property and is bordered by West 190th Street to the north, railroad tracks and South Normandie Avenue to the east, Parcel C to the south, and Parcel B to the west (Figure 3). Prior to building demolition, Parcel A contained Buildings 34, 36, 37, 61, 44, 45, 57, and 67; the northern portions of Buildings 29 and 58; and the chrome recovery system (CRS) located north of Building 40. The site also contained railroad tracks located on the eastern and western portions of Parcel A and a parking lot located on the western portion of Parcel A. Aerial photographs indicate the area was farmland before the 1940s. Industrial use of Parcel A began in 1941 when it was developed as part of an aluminum reduction plant. Prior to 1952, the aluminum reduction plant was converted to a steel manufacturing facility. In 1952, the Douglas Aircraft Company (DAC) used the facility to manufacture aircraft and aircraft components until approximately 1992. DAC used the buildings primarily for office space and storage. The property ownership was transferred to The Boeing Company during a merger with McDonnell Douglas Corporation in 1997. Currently, the former manufacturing facility has been demolished and approximately 40% of Parcel A has been redeveloped into an auto dealership.

1.3 PARCEL A EASEMENT EXCLUSION

An irregularly shaped easement just beyond the northeast corner of Parcel C, known as the Harborgate Way Easement, is excluded from evaluation under this site closure evaluation of Parcel A. The legal description of the easement is contained in a Declaration of Easements by BRC dated December 28, 1998 and is shown in Figure 2. The purpose of the easement is to identify the portion of Parcel A deep soil impacts related to sources originating in Parcel C. Shallow soil within the easement was closed by the RWQCB on April 21, 1998. The deep soil VOC impacts in this easement are currently being addressed with a soil vapor extraction (SVE) remediation system which is part of the Parcel C Building 1/36 remediation program. This SVE system was approved by the RWQCB on November 16, 2001. Upon completion of SVE operations within the Parcel A Harborgate Way Easement, a supplemental request for deep soil closure will be submitted to the RWQCB.

2.0 SITE INVESTIGATION RESULTS

2.1 SITE INVESTIGATION HISTORY

An evaluation of the previous investigation was conducted to assess whether the deep soil has been adequately characterized laterally and vertically for risk assessment and closure of Parcel A deep soil.

A review of the previous reports (listed in Appendix A) indicates that soil was investigated to depths of approximately 50 feet bgs. The water table is located at a depth of approximately 60 to 65 feet bgs. Approximately 550 soil samples were collected within 108 borings at depths ranging between 0.5 and 50 feet bgs and were analyzed for VOCs, semivolatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), total recoverable petroleum hydrocarbons (TRPH), polychlorinated biphenyls (PCBs), pesticides, and metals. Concentrations of detected compounds are shown on Figures 4, 5, and 6 (KJC 1996 and 1997).

Organic chemicals detected in deep soil samples include:

- 1,1-Dichloroethane (1,1-DCA)
- 1,2-Dichloroethane (1,2-DCA)
- 1,1-Dichloroethene (1,1-DCE)
- 1,2-Dichloroethene (1,2-DCE)
- cis-1,2-Dichloroethene (cis-1,2-DCE)
- Tetrachloroethene (PCE)
- 1,1,1-Trichloroethane (1,1,1-TCA)
- 1,1,2-Trichloroethane (1,1,2-TCA)
- Trichloroethene (TCE)
- Aroclor 1248
- Bis(2-ethylhexyl)phthalate
- Pyrene
- Total Recoverable Petroleum Hydrocarbons (TRPH)

The Parcel A Post-Demolition Risk Assessment report (Integrated 1998a) indicates that metals concentrations measured in onsite soil samples are within natural background levels, with the exception of arsenic, beryllium, chromium, copper, and lead.

Organic chemicals detected in groundwater beneath Parcel A include:

- Carbon disulfide
- Chloroform
- 1,1-DCA
- 1,1-DCE
- cis-1,2-DCE
- trans-1,2-DCE
- Toluene
- 1,1,2-TCA
- TCE
- Trichlorofluoromethane

- 1,2,4-Trimethylbenzene
- 1,3,5 Trimethylbenzene

Review of the analytical data for the soil samples collected in Parcel A indicates that the reported chemical concentrations related to releases from Parcel A operations appear to be adequately delineated both vertically and horizontally as shown in Figures 4, 5, and 6.

2.2 CHEMICALS OF POTENTIAL CONCERN

Calculation of human health risk and evaluation of threat to groundwater quality requires identification of the chemicals of potential concern (COPCs). COPCs were identified as those chemicals that could pose a human health risk due to vapor migration into buildings or a threat to groundwater quality at concentrations above drinking water standards. The COPCs for soil and groundwater are presented below, along with their maximum onsite concentrations.

Soil

• 1,1-DCA	0.060 mg/kg
• 1,2-DCA	0.0087 mg/kg
• 1,1-DCE	0.350 mg/kg
• 1,2-DCE	0.0061 mg/kg
• cis-1,2-DCE	0.043 mg/kg
• PCE	0.202 mg/kg
• 1,1,1-TCA	0.015 mg/kg
• 1,1,2-TCA	0.018 mg/kg
• TCE	0.200 mg/kg
• Aroclor 1248	0.130 mg/kg
• Bis (2-ethylhexyl) phthalate	2.300 mg/kg
• Pyrene	51.00 mg/kg
• TRPH	1,132 mg/kg

Organic chemicals detected in groundwater beneath Parcel A include:

Groundwater

• Carbon disulfide	0.002 mg/l
• Chloroform	0.002 mg/l
• 1,1-DCA	0.018 mg/l
• 1,1-DCE	2.000 mg/l
• cis-1,2-DCE	0.009 mg/l
• trans-1,2-DCE	0.015 mg/l

- Toluene 0.009 mg/l
- 1,1,2-TCA 0.0013 mg/l
- TCE 1.100 mg/l
- Trichlorofluoromethane 0.00052 mg/l
- 1,2,4-Trimethylbenzene 0.00021 mg/l
- 1,3,5 Trimethylbenzene 0.00051 mg/l

These data were used to complete the human health and groundwater impact assessment for Parcel A deep soil. It should be noted that the potential health risks associated with TRPH are assessed according to their toxic components (e.g. PAHs and aromatic hydrocarbons such as benzene).

3.0 HUMAN HEALTH RISK ASSESSMENT

Risk assessments have been performed to evaluate if chemicals present at Parcel A pose a human health risk above OEHHA approved risk levels. A post-demolition risk assessment was performed in 1998 (Integrated, 1998a) and risk assessment calculations were performed as part of this Parcel A deep soil evaluation. A brief summary of the post demolition risk assessment is provided, followed by a discussion of the human health risk assessment calculations performed for this report.

3.1 HISTORICAL RISK ASSESSMENTS

A post-demolition risk assessment was conducted in 1998 to evaluate "the health protectiveness of post-demolition site conditions" (Integrated 1998a). Based on a review of the post-demolition risk assessment and previous site investigation reports, the RWQCB indicated in a letter dated April 21, 1998, that no further action is required for the Parcel A shallow soil (0 to 12 feet bgs). The RWQCB also indicated that the California Human and Ecological Risk Division (HERD) agreed with the conclusion in the post-demolition risk assessment and that residual shallow soil impact risks fall within a range of values that HERD determines to be acceptable for the proposed land use, and the impact risks will not pose significant health risks for future site occupants.

Although an evaluation of human health risks from potential exposure to deep soil impacts (vapor) was performed and indicated no significant health risks, an evaluation of risk associated with existing or potential future groundwater concentrations due to migration of residual deep soil impacts was not performed. Therefore, no deep soil closure was issued. To address these risk issues, a supplemental assessment was performed.

3.2 SUPPLEMENTAL HUMAN HEALTH RISK ASSESSMENT

A review of the post-demolition risk assessment (Integrated 1998a) indicated that the following two human health exposure pathways associated with existing and potential future groundwater impacts were not considered:

- inhalation of VOCs in indoor air from upward VOC vapor migration from groundwater into onsite buildings, and

- inhalation of VOCs in indoor air due to VOC migration from deep soil leachate, migration to groundwater, and subsequent VOC vapor migration from groundwater into indoor air.

No other additional exposure pathways are considered complete for deep soil. Thus, the above-noted potential exposure pathways not previously addressed in the post-demolition risk assessment were evaluated and summarized herein.

The risk assessment calculations are described in Appendix B, and the results are presented in Appendices B and C. Adding the estimated risks from the above-listed pathways (risk assessment modeling output presented in Appendix C) to the potential on-site receptor risks presented in the post-demolition risk assessment do not result in risks greater than the OEHHA-approved acceptable risk levels.

4.0 POTENTIAL THREAT TO GROUNDWATER ASSESSMENT

The post-demolition risk assessment did not consider the potential threat to groundwater due to chemical leaching from deep soil impacts. Thus, potential degradation of groundwater quality due to chemical leaching from deep soil to groundwater was evaluated and summarized herein.

Results of our evaluation (detailed in Appendix B) indicate that leaching of maximum COPC concentrations in deep soil of Parcel A would not result in potential groundwater concentrations that are greater than MCLs, with the exception of 1,1-DCE and TCE. In addition, measured concentrations of TRPH (1,132 mg/kg) are less than their residual saturation concentration of 14,000 mg/kg in onsite soil (assumed to be silty sand) and, therefore, do not pose a threat of free product generation on the groundwater table.

The concentrations of 1,1-DCE and TCE in deep soil that exceed SSLs are identified in Figure 6. These include:

- 1,1-DCE (0.350 mg/kg) and/or TCE (0.120 mg/kg) concentrations at depths greater than 30 feet bgs in boring 1-6/2BB-1-6

- a concentration of 1,1-DCE (0.120 mg/kg) at a depth of 50 feet bgs in boring 1-23, and

- a concentration of TCE at depths of 25 and 30 feet bgs (0.200 and 0.150 mg/kg) in boring B15 and B-15-FS, and TCE (0.120 and 0.110 mg/kg) at depths of 40 and 50 feet bgs in boring NE-1/2BB-NE-2.

The above noted concentrations of 1,1-DCE and TCE in deep soil are less than two times greater than the SSLs. It is expected that the elevated concentration of TCE in boring NE-2/2BB-NE-2 will be remediated by the soil vapor extraction (SVE) treatment system scheduled to be started in April 2001. Concentrations of TCE in boring B15 and B-15-FS appear to be related to apparent releases from a former hazardous waste accumulation area nearby. These residual concentrations appear to be localized, and since the SSLs are very conservative values and the deep soil concentrations are less than two times the SSL, they do not appear to pose a significant threat to groundwater quality beneath Parcel A.

5.0 SUMMARY AND CONCLUSIONS

Based on the closure evaluation presented herein, it is recommended that no further action be granted by the RWQCB for deep soil impacts at Parcel A based on the following information and conclusions.

1. A review of the results of the deep soil investigation activities conducted at Parcel A from 1991 through 1998 indicates that both the vertical and lateral extent of soil impacts related to on-site activities have been delineated. Relatively low concentrations of 1,1-DCA, 1,2-DCA, 1,1-DCE, 1,2-DCE, cis-1,2-DCE, PCE, 1,1,1-TCA, 1,1,2-TCA, TCE, Aroclor-1248, bis(2-ethylhexyl)phthalate, Pyrene, and TRPH have been detected in onsite soil between depths of 12 and 50 feet bgs. Elevated concentrations of TCE and 1,1-DCE have been detected in onsite deep soil at depths between 25 and 50 feet bgs and in groundwater. Other chlorinated VOCs have also been detected in onsite groundwater.

2. In a letter from the RWQCB dated April 21, 1998, the RWQCB issued a letter of no further action for shallow soil in Parcel A. The RWQCB also indicated that the California Human and Ecological Risk Division (HERD) agreed with the conclusion in the post-demolition risk assessment and that residual shallow soil impact risks fall within a range of values that HERD determines to be acceptable for the proposed land use, and the impact risks will not pose significant health risks for future site occupants.

3. The post-demolition risk assessment, approved by the DTSC, indicates that deep soil does not pose a risk to human health greater than acceptable levels from inhalation of VOCs

from upward VOC vapor migration into onsite buildings. No other exposure pathways are considered complete for deep soil.

4. The following additional potential exposure pathways were evaluated using deep soil investigation results:

   - inhalation of VOCs in indoor air from upward VOC vapor migration from groundwater into onsite buildings, and

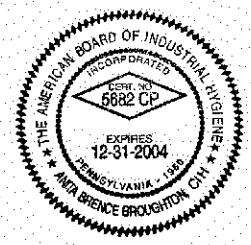
   - inhalation of VOCs in indoor air due to VOC migration from deep soil leachate to groundwater and subsequent upward VOC vapor migration from groundwater into indoor air.

   Adding the estimated risks from the above-listed pathways to the risks calculated for potential on-site receptors, as presented in the post-demolition risk assessment, do not result in risks greater than the OEHHA-approved risk levels for the BRC Former C-6 Facility property.

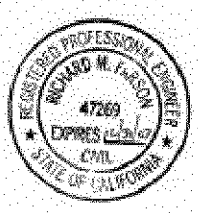
5. The existing residual chemical concentrations in onsite deep soil do not pose a threat to groundwater quality at levels greater than MCLs, with the potential exception of 1,1-DCE and TCE in four boring locations. Three of these areas will likely be remediated by the proposed SVE treatment system scheduled to be started in April 2002. Concentrations of TCE in boring B15 and B-15-FS appear to be related to apparent releases from a former hazardous waste accumulation area nearby. These residual concentrations appear to be localized, and since the SSLs are very conservative values and the deep soil concentrations are less than two times the SSL, they do not appear to pose a significant threat to groundwater quality beneath Parcel A.

If you have any questions regarding the content of this letter, please contact either of the undersigned at (619) 280-9210.

Sincerely yours,
HALEY & ALDRICH, INC.



Anita Broughton, REA, CIH
Risk Assessment Task Manager



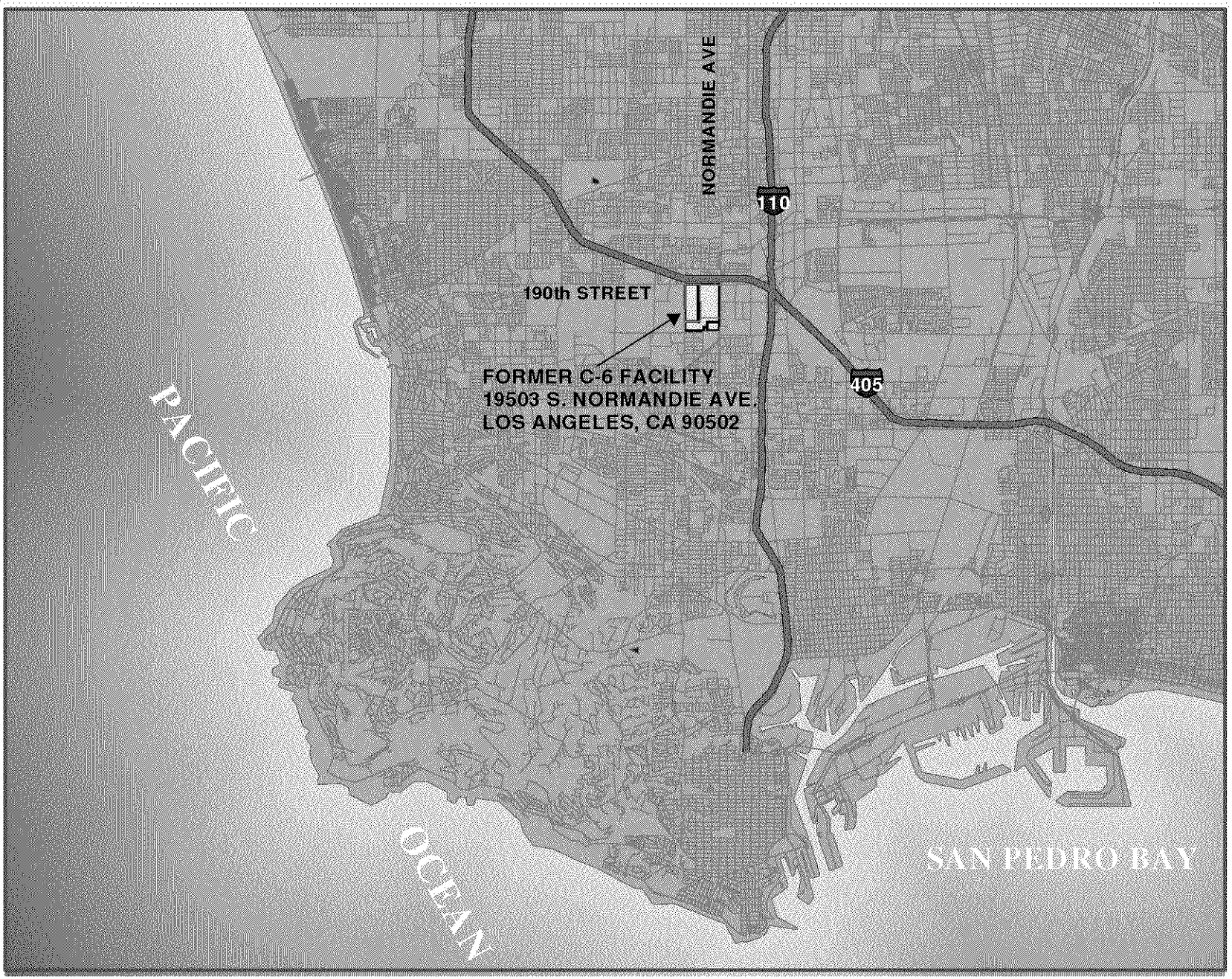
Richard M. Farson, P.E.
Senior Engineer

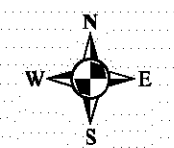
Scott Zachary
Project Manager

Attachments

List of Attachments

FIGURES





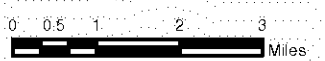
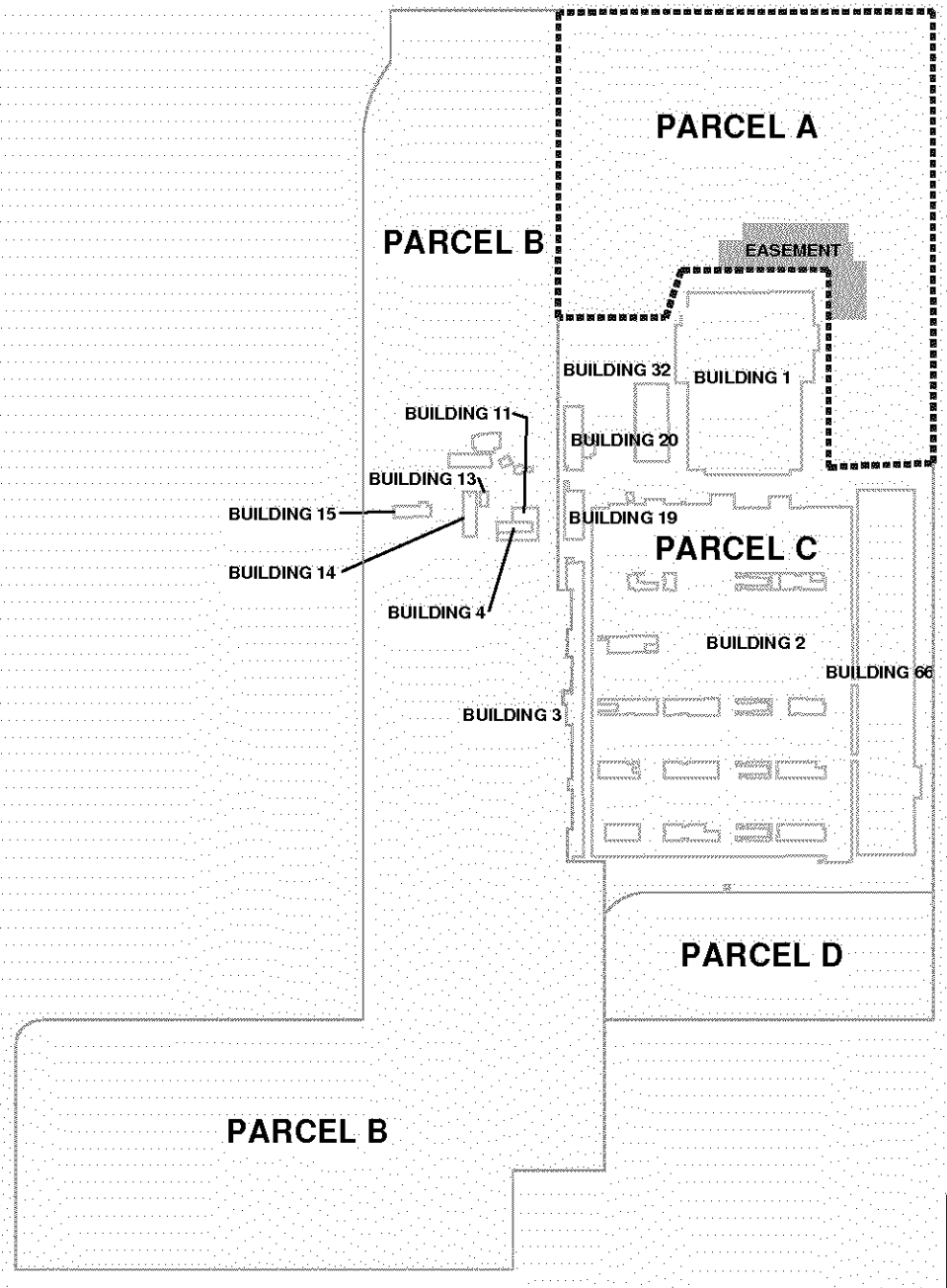


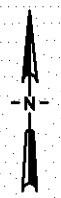
Figure 1
Site Location Map

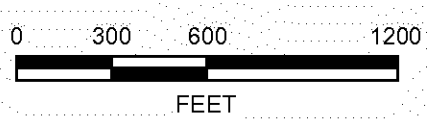
Boeing Realty Corporation
Former C-6 Facility
Los Angeles, California

HALEY & ALDRICH
UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

Scale : As Shown	QA/QC :	Project : 27285
Drawn : DFM	Reviewed : SPZ	Date : 1 March 2002







SOURCE: Kennedy/Jenks Consultants, Sampling & Analysis Plan, Boeing Realty Corporation's C-6 Facility-Parcel C, Los Angeles, California, 15 August, 2000

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FORMER C-6 FACILITY
LOS ANGELES, CALIFORNIA

FIGURE: 2

PARCEL A SITE PLAN

SCALE: AS SHOWN		PROJECT: 27285-002
DRAWN: SAL	REVIEWED: RLM	DATE: 22 APRIL 2002

BOE-C6-0058797

N

0 200 400 800

FEET

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FORMER C-6 FACILITY
LOS ANGELES, CALIFORNIA

FIGURE: 3

SURROUNDING PROPERTIES MAP

SCALE: AS SHOWN		PROJECT: 27285-002
DRAWN: SAL	REVIEWED: MM	DATE: 22 APRIL 2002

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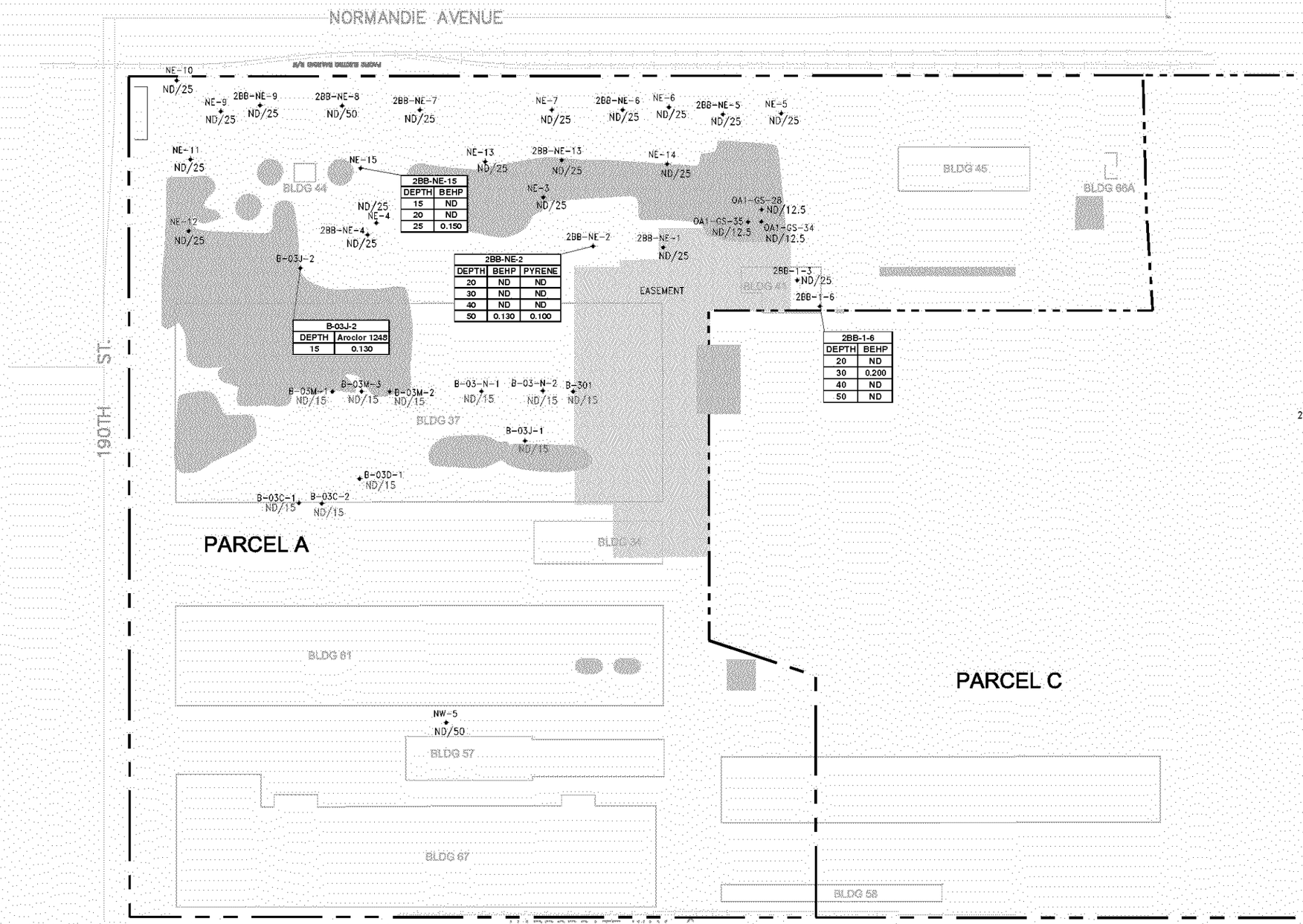

LEGEND

- 2BB-1-21 — SOIL BORING LOCATION
- PARCEL BOUNDARY
- BUILDING FOOTPRINTS (FORMER)
- ND/25 — BIS (2-ETHYLHEXEL) PHTHALATE AND PYRENE (mg/kg) LESS THAN METHOD DETECTION LIMIT IN ALL SAMPLES UNLESS OTHERWISE INDICATED / TOTAL DEPTH OF BORING
- ND/25 — AROCLOR 1248 (mg/kg) LESS THAN METHOD DETECTION LIMIT IN ALL SAMPLES UNLESS OTHERWISE INDICATED / TOTAL DEPTH OF BORING
- EASEMENT INCLUDED WITH PARCEL C CLOSURE
- EXCAVATION

NOTE: ALL CONCENTRATIONS UNITS EXPRESSED AS (mg/kg)
DEPTH IN FEET

N

0 40 80 160
FEET

ALL DIMENSIONS AND LOCATIONS APPROXIMATE

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FIGURE: 4

PARCEL A SVOC & PCB CONCENTRATIONS IN SOIL GREATER THAN 12 FEET BGS

SCALE: AS SHOWN | PROJECT: 27285-002
DRAWN: SAL | REVIEWED: MM | DATE: 22 APRIL 2002

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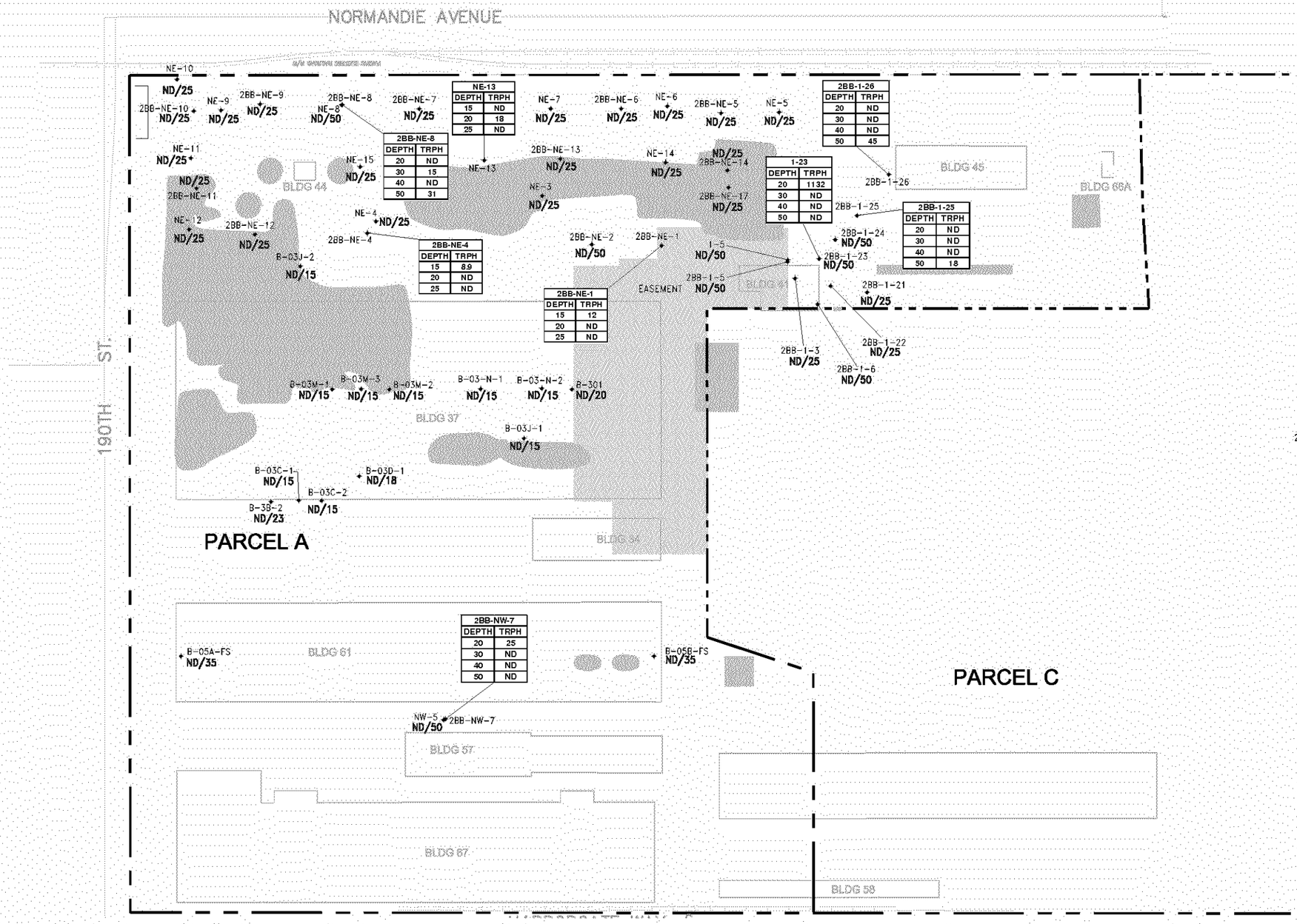

LEGEND

- 2BB-1-21 — SOIL BORING LOCATION
- PARCEL BOUNDARY
- BUILDING FOOTPRINTS (FORMER)
- ND/25 — TRPH LESS THAN METHOD DETECTION LIMIT IN ALL SAMPLES UNLESS OTHERWISE INDICATED / TOTAL DEPTH OF BORING
- TRPH — TOTAL RECOVERABLE PETROLEUM HYDROCARBONS
- REMEDIATION EASEMENT INCLUDED WITH PARCEL C CLOSURE
- EXCAVATION

NOTE: ALL CONCENTRATIONS UNITS EXPRESSED AS (mg/kg)
DEPTH IN FEET

N

0 40 80 160
FEET

ALL DIMENSIONS AND LOCATIONS APPROXIMATE

(002) 2725055

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LOS ANGELES, CALIFORNIA

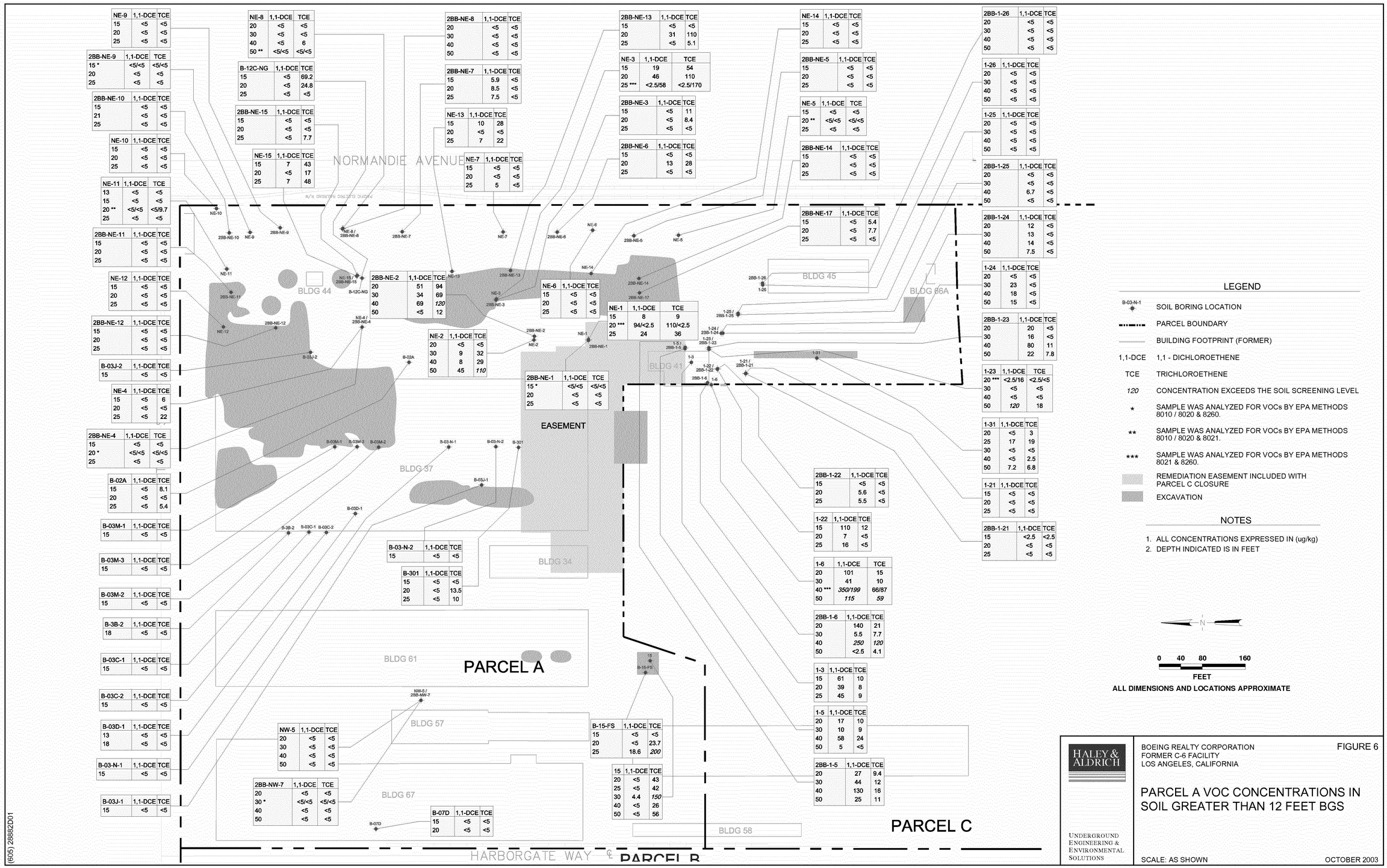
FIGURE 5

PARCEL A TRPH CONCENTRATIONS IN SOIL GREATER THAN 12 FEET BGS

SCALE: AS SHOWN

OCTOBER 2003

BOE-C6-0058800



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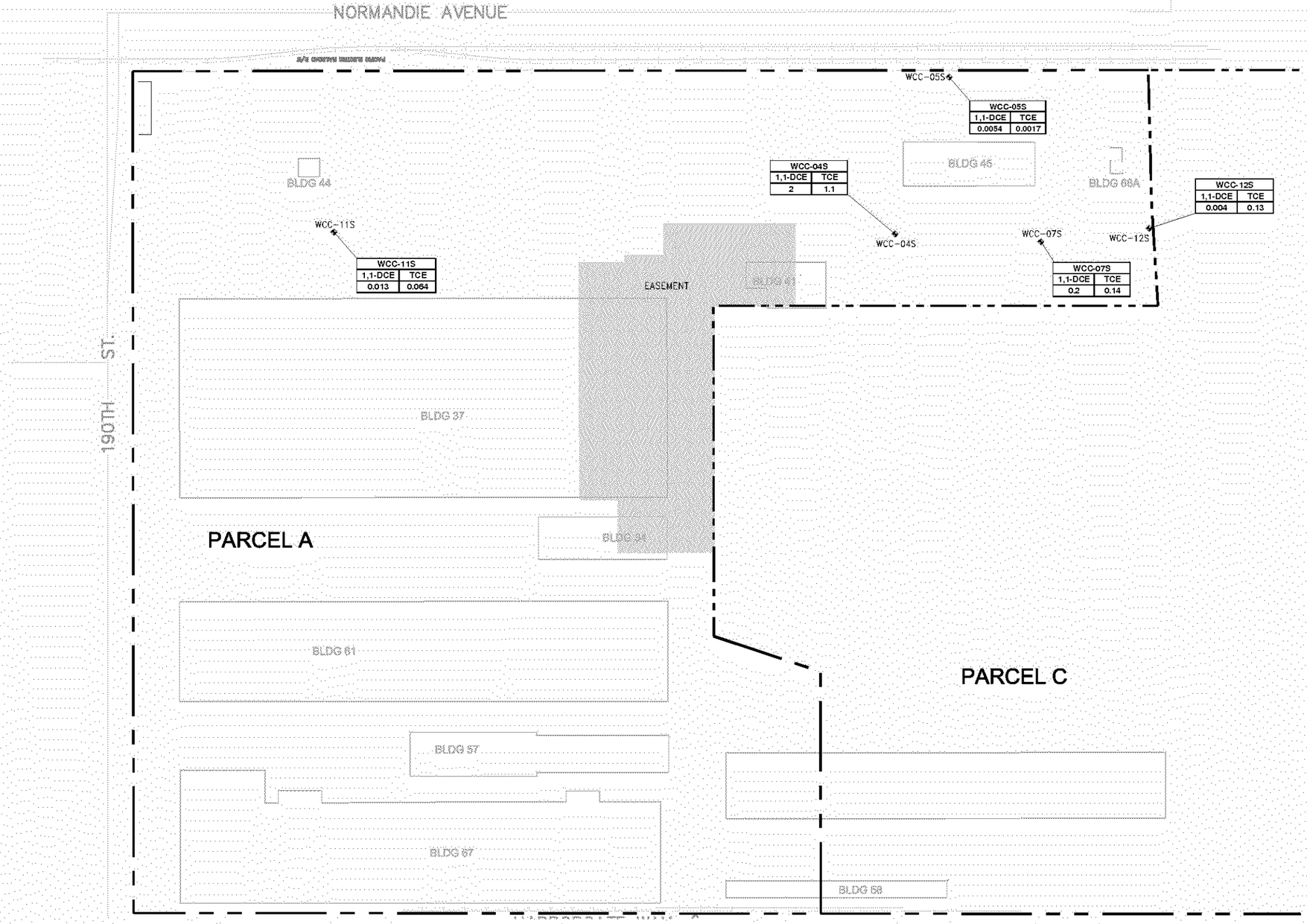

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LOS ANGELES, CALIFORNIA

FIGURE: 7

PARCEL A 1,1-DCE & TCE CONCENTRATIONS IN GROUNDWATER

SCALE: AS SHOWN | PROJECT: 27285-002
DRAWN: SAL | REVIEWED: MM | DATE: 22 APRIL 2002

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Appendix A
References

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Parcel A – Phase II Soil Characterization, McDonnell Douglas Realty Company C-6 Facility, Los Angeles, California, prepared by Kennedy/Jenks Consultants, and dated July 9, 1997 (KJC 1997)

Health-Based Remediation Goals for Surface Soils, McDonnell Douglas Realty Company, C-6 Facility, Parcel A, prepared by Integrated Environmental Services, Inc. (Integrated), and dated August 1997 (Integrated 1997)

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Response to RWQCB Memo Regarding the Post Demolition Risk Assessment, March 31, 1998 prepared by Integrated Environmental Services, Inc., and dated April 13, 1998 (Integrated 1998b)

Letter prepared by the Los Angeles Regional Water Quality Control Board (RWQCB) for No Further Action For Shallow Soil: Parcel A, Boeing Realty Corporation C-6 Facility, Los Angeles, California (File No. 100.315)(SLIC No. 410) dated April 21, 1998 (RWQCB 1998)

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Boeing Realty Corporation's C-6 Facility, Los Angeles, California, Groundwater Monitoring Report, 2nd Quarter 2000, prepared by Kennedy/Jenks Consultants, and dated July 2000 (KJC 2000b)

Groundwater Monitoring Report Annual Event January/February 2001, Former C-6 Facility, Los Angeles, California, prepared by Haley & Aldrich and EnglandGeoSystem, and dated April 12, 2001 (England 2001)

Appendix B
Risk Assessment Discussion and Calculations

PARCEL A RISK ASSESSMENT DISCUSSION AND CALCULATIONS

Additional risk assessment calculations were performed to supplement the initial post-demolition risk assessment previously submitted to the RWQCB and HERD (Integrated 1998b). These additional risk calculations were used to evaluate additional potential human health risk associated with deep soil residual impacts in Parcel A. Human health risks were evaluated for the following additional potential exposure pathways using deep soil and groundwater investigation results:

- inhalation of VOCs in indoor air from upward VOC vapor migration from groundwater into onsite buildings

- inhalation of VOCs in indoor air due to VOC migration from deep soil leachate migration to groundwater and subsequent VOC vapor migration from groundwater into indoor air

The potential for further degradation of groundwater due to chemical leaching from soil to groundwater was also evaluated.

It should be noted that this evaluation includes all areas of Parcel A with the exception of the Harborgate Way Easement (Figure 2). This easement is the portion of Parcel A deep soil that is impacted with VOCs from sources located in Parcel C. This easement is being addressed as part of the Parcel C environmental program.

The results of the additional risk assessment and the groundwater quality impact assessment are presented below.

GROUNDWATER QUALITY IMPACT ASSESSMENT

The objective of the groundwater quality impact assessment is to evaluate whether existing chemical concentrations in onsite deep soils have the potential to degrade existing groundwater quality. Even though shallow groundwater beneath and in proximity to subject parcel is not used as a domestic water supply, the RWQCB requested, as a conservative measure, that an evaluation be conducted of potential downward chemical migration from soil resulting in possible degradation of the Bellflower aquitard. The Bellflower aquitard is the most shallow water-bearing zone beneath Parcel A. This evaluation conservatively and unrealistically assumes that the Bellflower aquitard is a part of the underlying aquifers providing domestic water supply. As described below, the assessment was conducted by further assuming a conservative scenario regarding chemical migration and mixing in groundwater following approved EPA and RWQCB methodology and assumptions.

The maximum COPC concentrations in soil were compared to site-specific soil screening levels (SSLs) derived from California drinking water standards, specifically primary or secondary MCLs, for depths of 25, 40 and 50 feet below ground surface. Initial site-specific

SSLs were derived using the following formula presented in Section 2.5 of the EPA document entitled *Soil Screening Guidance: Technical Background Document (TBD),* dated July 1996:

$$\text{Initial SSL} = \text{MCL}\ [(K_{oc} * f_{oc}) + ((O_w + O_a * H')/P_b)] \qquad \text{(Equation 1)}$$

Where:

Initial SSL = soil screening level, mg/kg;
MCL = maximum contaminant level, mg/L;
K_{oc} = soil organic carbon-water partition coefficient, L/kg;
f_{oc} = organic carbon content of soil, kg/kg;
O_w = water-filled soil porosity, L_{water}/L_{soil};
O_a = air-filled soil porosity, L_{air}/L_{soil};
H' = Henry's law constant, dimensionless; and
P_b = dry soil bulk density, kg/L.

Site-specific geotechnical parameters are presented in Table B-1. The above equation is a partitioning formula, which does not account for chemical attenuation during migration in soil or mixing with groundwater. To better represent contaminant migration in the soil column, attenuation factors were applied to the initial SSLs. The attenuation factors for VOCs were derived using Table 5-14: Average Attenuation Factor for Different Distance above Ground Water and Lithology presented in the RWQCB's May 1996 *Interim Site Assessment & Cleanup Guidebook* (the Guidebook), and the attenuation factors for non-VOCs were derived using the formulas presented in Appendix A of that same document. The attenuation factors were derived assuming site-specific average soil particle size distributions and distances of 40, 25, and 15 feet from soil impacts to the groundwater table. Groundwater at the site is approximately 65 feet bgs.

An EPA default dilution attenuation factor (DAF) of 20 was applied to the initial SSLs to account for limited groundwater mixing. This EPA default value is presented in the above-referenced July 1996 EPA document, and was used by EPA to develop generic SSLs. The resulting site-specific SSL for each detected chemical at a particular depth to groundwater is equal to the initial SSL (assuming no soil attenuation or groundwater mixing) multiplied by the product of the associated soil attenuation factor and a groundwater mixing factor of 20.

The site-specific SSLs are conservative. Both the soil attenuation factor and the DAF are likely greater than estimated. A greater soil attenuation factor and greater DAF would result in higher SSL concentrations, which would allow for higher soil concentrations to be left in place and still be protective of groundwater. For instance:

- In the soil attenuation factor derivation, the RWQCB assumes that the chemical transport rate is 10 times higher (chemicals migrate 10 times faster) in the groundwater smear zone, assumed to be present 40 feet above groundwater table. Actual groundwater elevations at the Facility between 1988 to 2001 indicate the groundwater table has risen 10 feet and fallen 2 feet over this period. Based on the historical data for the Facility, it appears that

the assumed 40-foot zone of increased chemical transport is over four times larger than the actual data suggests. The actual soil attenuation factor is, thus, likely greater than estimated.

The EPA default DAF of 20 assumes no attenuation once the chemicals reach the groundwater table, no chemical degradation, a receptor well located at the edge of the chemical source, and a chemical source of 0.5 acre. In reality, chemicals do attenuate to some degree as they migrate in the saturated zone, most organic chemicals naturally degrade in the environment, no receptor wells are located within miles of the Facility, and contaminant sources on Parcel B are less than 0.5 acre. The actual DAF is, thus, likely greater than estimated.

The calculation of site-specific SSLs for COPCs that have promulgated MCLs is presented in Tables B-3 and B-8. A comparison of the calculated site-specific SSLs with the maximum COPC concentrations in soil is also presented in Table B-3, B-5, and B-7.

The maximum chemical concentrations in onsite soil do not exceed the site-specific groundwater protection concentrations (i.e., site-specific SSLs), with the exception 1,1-DCE and TCE. The concentrations of 1,1-DCE and TCE in deep soil that exceed SSLs are identified in Figure 6. These include:

- 1,1-DCE and/or TCE concentrations at depths greater than 30 feet bgs in boring 1-6/2BB-1-6
- a concentration of 1,1-DCE at a depth of 50 feet bgs in boring 1-23, and
- a concentration of TCE at depths of 25 and 30 feet bgs in boring B15 and B-15-FS, and depths of 40 and 50 feet bgs in boring NE-1/2BB-NE-2.

The above noted concentrations of 1,1-DCE and TCE in deep soil are less than two times greater than the SSLs. It is expected that the elevated concentration of TCE in boring NE-2/2BB-NE-2 will be remediated by the soil vapor extraction (SVE) treatment system scheduled to be started in April 2001. Concentrations of TCE in boring B15 and B-15-FS appear to be related to apparent releases from a former hazardous waste accumulation area nearby. These residual concentrations appear to be localized, and since the SSLs are very conservative values and the deep soil concentrations are less than two times the SSL, they do not appear to pose a significant threat to groundwater quality beneath Parcel A.

INHALATION OF INDOOR AIR – VOC VAPOR MIGRATION FROM GROUNDWATER INTO INDOOR AIR

Human health risk associated with VOC vapor migration from groundwater into onsite buildings and subsequent inhalation of indoor air was calculated for the onsite commercial/industrial worker. These risks were estimated using the County of San Diego

Department of Environmental Health (DEH) vapor migration model and the highest VOC concentrations in groundwater obtained from the most recent samples collected from groundwater monitoring wells WCC-04S, WCC-05S, WCC-07S, WCC-11S, and WCC-12S. The model results are presented in Appendix C, and a summary of the results is presented in Table B-9.

As shown in Table B-9, both the estimated excess cancer risk and estimated hazard index are less than the OEHHA-approved acceptable risk thresholds of 1.0×10^{-5} and 1.0, respectively. Thus, the existing VOC concentrations in groundwater beneath Parcel A do not pose an indoor air health risk greater than OEHHA-approved risk levels.

INHALATION OF INDOOR AIR – VOC MIGRATION FROM SOIL LEACHATE MIGRATION TO GROUNDWATER AND SUBSEQUENT VOC VAPOR MIGRATION FROM GROUNDWATER INTO INDOOR AIR

VOCs in soil may leach into groundwater and subsequently volatilize from groundwater and, through upward diffusion, migrate through the soil column into indoor air. The SSL equation (Equation 1) was used to estimate maximum VOC concentrations in pore water by substituting the SSL parameter with maximum onsite soil concentrations in the equation to derive the maximum pore water concentration instead of the MCL:

$$C_{pw} = C_s / [(K_{oc} * f_{oc}) + ((O_w + O_a*H')/P_b)] \qquad \text{(Equation 2)}$$

Where:

C_{pw} = maximum VOC concentration in pore water, mg/L; and
C_s = maximum VOC concentration in soil, mg/kg.

The estimated maximum VOC concentration in groundwater was then derived by applying no soil attenuation factor (attenuation factor of 1) and the EPA DAF of 20 to the maximum pore water concentration. The soil attenuation factor of 1 is extremely conservative in that its use provides the assumption that the pore water concentrations are present at the groundwater table. Thus, it is assumed that no soil attenuation occurs, even though the maximum concentrations of VOCs on Parcel A were measured at various depths in the soil column where some level of attenuation would be expected. The resulting estimated maximum VOC concentrations in groundwater are presented in Table B-10.

Human health risk associated with the inhalation of vapors in buildings resulting from migration of VOC vapors from the above-noted estimated chemical concentrations in groundwater were estimated for the onsite commercial/industrial worker using the DEH vapor migration model. The model results are presented in Appendix C, and a summary of the results is presented in Table B-11. As shown in Table B-11, both the estimated excess cancer risk and estimated hazard index are less than the risk thresholds of 1.0×10^{-5} and 1.0,

respectively. Thus, vapor migration from groundwater due to VOC leaching to groundwater does not pose an indoor air health risk greater than acceptable risk levels.

CUMULATIVE HUMAN HEALTH RISKS

As indicated in the previous sections, the following additional potential exposure pathways were evaluated using the deep soil investigation results:

- inhalation of VOCs in indoor air from upward VOC vapor migration from groundwater into onsite buildings

- inhalation of VOCs in indoor air due to VOC migration from deep soil leachate migration to groundwater and subsequent VOC vapor migration from groundwater into indoor air

The risks associated with the above-listed exposure pathways, and the estimated risks to potential onsite receptors as presented in the post-demolition risk assessment are summarized in Table B-12. As shown in Table B-12, adding the estimated risks from the above-listed pathways to the estimated risks to the potential on-site receptors do not result in risks greater than the OEHHA-approved acceptable risk levels.

Table B-1. Site-specific Geotechnical Parameters at the BRC Former C-6 Facility

Sample ID	Date Sampled	Depth (feet bgs)	Sieve Analysis (Soil Type)	Dry Bulk Density (kg/L)	Moisture Content (percent by weight)	Total Porosity (fraction by volume)	Air-filled Porosity (fraction by volume)	Water-filled Porosity (fraction by volume)	TOC* (mg/kg)	f_{oc} (fraction by weight)
EIA290176-004 (I-34-20)	1/29/2001	20	Silt	1.54	17.5	0.42	0.15	0.27	330	0.0003
EIA290176-012 (D-29-20)	1/29/2001	20	Silt	1.55	17.0	0.41	0.15	0.26	430	0.0004
EIA29176-021 (I-25-20)	1/29/2001	20	Silt	1.37	20.2	0.48	0.20	0.28	410	0.0004
EIA290176-007 (I-34-50)	1/29/2001	50	Fine sand	1.35	4.4	0.51	0.45	0.06	230	0.0002
EIA29176-015 (D-29-50)	1/29/2001	50	Fine sand	1.36	19.5	0.49	0.22	0.26	560	0.0006
EIA29176-024 (I-25-50)	1/29/2001	50	Silt	1.34	24.3	0.51	0.18	0.32	470	0.0005
Average (25 feet bgs to groundwater table)				1.42		0.47	0.23	0.24		0.0004
Average (50 feet bgs to groundwater table)				1.35		0.50	0.28	0.22		0.0004

Notes:
The air-filled porosity values were calculated from gravimetric data, not volumetric data.

* f_{oc} = the weight fraction of organic carbon in soil = TOC/1,000,000

Table B-2. Soil Particle Size Distribution at BRC Former C-6 Facility

Sample ID	Date Sampled	Depth (feet bgs)	Sieve Analysis (Soil Type)	Median Grain Size (mm)	Particle Size Distribution, wt. Percent						
					Gravel	Sand Size				Silt	Clay
						Coarse	Medium	Fine	TOTAL		
EIA290176-004 (I-34-20)	1/29/2001	20	Silt	0.032	0.00	0.00	0.00	31.19	31.19	54.83	13.99
EIA290176-012 (D-29-20)	1/29/2001	20	Silt	0.036	0.00	0.00	0.90	27.59	28.49	59.67	11.85
EIA29176-021 (I-25-20)	1/29/2001	20	Silt	0.020	0.00	0.00	0.00	11.21	11.21	69.07	19.72
EIA290176-007 (I-34-50)	1/29/2001	50	Fine sand	0.151	0.00	0.00	0.57	79.33	79.90	17.39	2.71
EIA29176-015 (D-29-50)	1/29/2001	50	Fine sand	0.083	0.00	0.00	3.26	47.93	51.19	39.79	9.01
EIA29176-024 (I-25-50)	1/29/2001	50	Silt	0.027	0.00	0.00	0.04	21.27	21.31	64.99	13.70
Average (25 feet bgs to groundwater table)									37.22	50.96	11.83
Average (50 feet bgs to groundwater table)									50.80	40.72	8.47

Table B-3. Derivation of Soil Attenuation Factor for VOCs and Comparison of Maximum Soil Concentrations to Site-specific SSLs Calculated at 25 Feet Below Ground Surface

CAS No.	Chemical	MCL (mg/L)	K_{oc} [1,2]	f_{oc} [3]	K_d [4,5]	H' [1]	O_w [3]	O_a [3]	P_b [3]	Max. Residual Soil Concentration (mg/kg)	AF at D=15'	Site-specific SSL (mg/kg) at AF = 1	Site-specific SSL (mg/kg) at AF at D=15'	Site-specific SSL (mg/kg) at AF at D=15' and DAF=20	Max > SSL for at AF_T at D=15' and DAF=20?
12672-29-	Aroclor-1248	5.00E-04	3.1E+05	4.05E-04	--	3.5E-02	2.4E-01	2.3E-01	1.42E+00	1.30E-01	19	6.29E-02	1.19E+00	2.39E+01	No
7440-38-2	Arsenic	5.00E-02	--	4.05E-04	2.90E+01	--	2.4E-01	2.3E-01	1.42E+00	4.50E+00	4	1.46E+00	6.43E+00	1.29E+02	No
7440-41-7	Beryllium	4.00E-03	--	4.05E-04	7.9E+02	--	2.4E-01	2.3E-01	1.42E+00	9.20E-01	119	3.16E+00	3.78E+02	7.55E+03	No
117-81-7	Bis(2-ethylhexyl)phthalate	4.00E-03	1.5E+07	4.05E-04	--	4.2E-06	2.4E-01	2.3E-01	1.42E+00	2.00E-01	925	2.45E+01	2.26E+04	4.52E+05	No
16065-83-	Chromium (trivalent)	5.00E-02	--	4.05E-04	1.8E+06	--	2.4E-01	2.3E-01	1.42E+00	4.40E+01	272110	9.00E+04	2.45E+10	4.90E+11	No
7440-50-8	Copper	1.0E+00	--	4.05E-04	4.3E+02	--	2.4E-01	2.3E-01	1.42E+00	5.45E+01	65	4.28E+02	2.77E+04	5.54E+05	No
75-34-3	1,1-Dichloroethane (1,1-DCA)	5.00E-03	5.3E+01	4.05E-04	--	2.3E-01	2.4E-01	2.3E-01	1.42E+00	6.00E-02	7	1.15E-03	7.78E-03	1.56E-01	No
107-06-2	1,2-Dichloroethane (1,2-DCA)	5.00E-04	3.8E+01	4.05E-04	--	4.0E-02	2.4E-01	2.3E-01	1.42E+00	8.70E-03	7	9.66E-05	6.55E-04	1.31E-02	No
75-35-4	1,1-Dichloroethene (1,1-DCE)	6.00E-03	6.5E+01	4.05E-04	--	1.1E+00	2.4E-01	2.3E-01	1.42E+00	1.10E-01	7	2.24E-03	1.52E-02	3.04E-01	No
75-35-4	cis-1,2-DCE	6.00E-03	3.6E+01	4.05E-04	--	1.7E-01	2.4E-01	2.3E-01	1.42E+00	4.30E-02	7	1.28E-03	8.67E-03	1.73E-01	No
127-18-4	Tetrachloroethene (PCE)	5.00E-03	2.7E+02	4.05E-04	--	7.5E-01	2.4E-01	2.3E-01	1.42E+00	2.02E-01	7	2.00E-03	1.36E-02	2.72E-01	No
71-55-6	1,1,1-TCA	2.00E-01	1.4E+02	4.05E-04	--	7.1E-01	2.4E-01	2.3E-01	1.42E+00	1.35E-02	7	6.83E-02	4.63E-01	9.26E+00	No
79-00-5	1,1,2-TCA	5.00E-03	7.5E+01	4.05E-04	--	3.7E-02	2.4E-01	2.3E-01	1.42E+00	1.80E-02	7	1.04E-03	7.04E-03	1.41E-01	No
79-01-6	Trichloroethene (TCE)	5.00E-03	9.4E+01	4.05E-04	--	4.2E-01	2.4E-01	2.3E-01	1.42E+00	2.00E-01	7	1.38E-03	9.37E-03	1.87E-01	**Yes**

An SSL was not derived for chemicals that do not have promulgated primary MCLs. These chemicals were not included in the assessment of potential degradation to groundwater quality.

AF = Average attenuation factor based on site lithology (distance to groundwater = 40 feet, 37% sand, 51% silt, and 12% clay).

na = not available
K_{oc} = soil organic carbon-water partition coefficient (L/kg)
f_{oc} = site-specific organic carbon content of soil (kg/kg)
K_d = soil-water partition coefficient (L/kg), $K_{oc} \times f_{oc}$
H' = dimensionless Henry's law constant
O_w = site-specific average water-filled porosity (by volume)
O_a = site-specific average air-filled porosity (by volume)
P_b = dry soil bulk density (kg/L)

[1] Obtained from EPA Region 9 preliminary remediation goal (PRG) physical-chemical data for volatile organic compounds, November 2000
[2] Obtained from Risk Assessment Information System (RAIS) Toxicity & Chemical-Specific Factors Data Base, January 2001, http://risk.lsd.ornl.gov/cgi-bin/tox/TOX_select?select=csf
[3] Site-specific average values
[4] Obtained from EPA Soil Screening Guidance: Technical Background Document (TBD), EPA/540/R-95/128, July 1996, http://www.epa.gov/oerrpage/superfund/resources/soil/toc.htm

Table B-4. Derivation of Soil Attenuation Factors for Non-VOCs at 25 Feet Below Ground Surface

CAS No.	Chemical	K_{oc} [1,2,4]	f_{oc} [3]	K_d [2,4]	H' [1]	O_w [3]	O_a [3]	P_b [3]	O_t	AF_{max}	Distance to Groundwater (feet)	AF_D	AF_T	**AF_T**
12672-29-6	Aroclor-1248	3.1E+05	4.1E-04	--	3.5E-02	2.43E-01	2.27E-01	1.42E+00	4.70E-01	734	40	73.38	19.01	19
7440-38-2	Arsenic	--	--	2.90E+01		2.43E-01	2.27E-01	1.42E+00	4.70E-01	170	40	17.03	4.41	4
7440-41-7	Beryllium	--	--	7.9E+02		2.43E-01	2.27E-01	1.42E+00	4.70E-01	4612	40	461.20	119.45	119
117-81-7	Bis (2-ethylhexyl)phthalate	1.5E+07	4.1E-04	--	4.2E-06	2.43E-01	2.27E-01	1.42E+00	4.70E-01	35696	40	3569.57	924.52	925
16065-83-	Chromium (trivalent)	--	--	1.8E+06		2.43E-01	2.27E-01	1.42E+00	4.70E-01	10506174	40	1050617.38	272109.90	272110
7440-50-8	Copper	--	--	4.3E+02		2.43E-01	2.27E-01	1.42E+00	4.70E-01	2499	40	249.91	64.73	65

na = not available

An AF_T was not derived for chemicals that do not have promulgated primary MCLs. These chemicals were not included in the assessment of potential furthe degradation to groundwater quality.

AFT were calculated assuming that the depth between chemical impacts and groundwater is 40 feet and that the soil within this portion of the soil column is comprised of 37% sand, 51% silt, and 12% clay.

K_{oc} = soil organic carbon-water partition coefficient (L/kg)

f_{oc} = site-specific organic carbon content of soil (kg/kg)

K_d = soil-water partition coefficient (L/kg), K_{oc} x f_{oc}

H' = dimensionless Henry's law constant

O_w = site-specific average water-filled porosity (by volume)

O_a = site-specific average air-filled porosity (by volume)

Ot = site-specific average total porosity (by volume)

P_b = dry soil bulk density (kg/L)

[1] Obtained from EPA Region 9 preliminary remediation goal (PRG) physical-chemical data for volatile organic compounds, November 2000

[2] Obtained from Risk Assessment Information System (RAIS) Toxicity & Chemical-Specific Factors Data Base, January 2001, http://risk.lsd.ornl.gov/cgi-bin/tox/TOX_select?select=csf

[3] Site-specific average values

[4] Obtained from EPA Soil Screening Guidance: Technical Background Document (TBD), EPA/540/R-95/128, July 1996, http://www.epa.gov/oerrpage/superfund/resources/soil/toc.htm

Table B-5. Derivation of Soil Attenuation Factor for VOCs and Comparison of Maximum Soil Concentrations to Site-specific SSLs Calculated at 40 Feet Below Ground Surface

CAS No.	Chemical	MCL (mg/L)	K_{oc} [1,2]	f_{oc} [3]	K_d [4,5]	H' [1]	O_w [3]	O_a [3]	P_b [3]	Max. Residual Soil Concentration (mg/kg)	AF at D=15'	Site-specific SSL (mg/kg) at AF = 1	Site-specific SSL (mg/kg) at AF at D=15'	Site-specific SSL (mg/kg) at AF at D=15' and DAF=20	Max > SSL for at AF_T at D=15' and DAF=20?
7440-38-2	Arsenic	5.00E-02	--	4.05E-04	2.90E+01	--	2.4E-01	2.3E-01	1.42E+00	2.30E+01	3	1.46E+00	4.16E+00	8.32E+01	No
7440-41-7	Beryllium	4.00E-03	--	4.05E-04	7.9E+02	--	2.4E-01	2.3E-01	1.42E+00	4.10E-01	75	3.16E+00	2.36E+02	4.73E+03	No
16065-83-1	Chromium (trivalent)	5.00E-02	--	4.05E-04	1.8E+06	--	2.4E-01	2.3E-01	1.42E+00	5.10E+01	170069	9.00E+04	1.53E+10	3.06E+11	No
7440-50-8	Copper	1.0E+00	--	4.05E-04	4.3E+02	--	2.4E-01	2.3E-01	1.42E+00	3.30E+01	41	4.28E+02	1.74E+04	3.47E+05	No
75-35-4	1,1-Dichloroethene (1,1-DCE)	6.00E-03	6.5E+01	4.05E-04	--	1.1E+00	2.4E-01	2.3E-01	1.42E+00	3.50E-01	4	2.24E-03	9.61E-03	1.92E-01	**Yes**
71-55-6	1,1,1-TCA	2.00E-01	1.4E+02	4.05E-04	--	7.1E-01	2.4E-01	2.3E-01	1.42E+00	1.50E-02	4	6.83E-02	2.93E-01	5.86E+00	No
79-01-6	Trichloroethene (TCE)	5.00E-03	9.4E+01	4.05E-04	--	4.2E-01	2.4E-01	2.3E-01	1.42E+00	1.20E-01	4	1.38E-03	5.93E-03	1.19E-01	**Yes**

An SSL was not derived for chemicals that do not have promulgated primary MCLs. These chemicals were not included in the assessment of potential degradation to groundwater quality.

AF = Average attenuation factor based on site lithology (distance to groundwater = 25 feet, 37% sand, 51% silt, and 12% clay).

na = not available

K_{oc} = soil organic carbon-water partition coefficient (L/kg)

f_{oc} = site-specific organic carbon content of soil (kg/kg)

K_d = soil-water partition coefficient (L/kg), K_{oc} x f_{oc}

H' = dimensionless Henry's law constant

O_w = site-specific average water-filled porosity (by volume)

O_a = site-specific average air-filled porosity (by volume)

P_b = dry soil bulk density (kg/L)

[1] Obtained from EPA Region 9 preliminary remediation goal (PRG) physical-chemical data for volatile organic compounds, November 2000

[2] Obtained from Risk Assessment Information System (RAIS) Toxicity & Chemical-Specific Factors Data Base, January 2001, http://risk.lsd.ornl.gov/cgi-bin/tox/TOX_select?select=csf

[3] Site-specific average values

[4] Obtained from EPA Soil Screening Guidance: Technical Background Document (TBD), EPA/540/R-95/128, July 1996, http://www.epa.gov/oerrpage/superfund/resources/soil/toc.htm

Table B-6. Derivation of Soil Attenuation Factors for Non-VOCs at 40 Feet Below Ground Surface

CAS No.	Chemical	K_{oc} [1,2,4]	f_{oc} [3]	K_d [2,4]	H' [1]	O_w [3]	O_a [3]	P_b [3]	O_t	AF_{max}	Distance to Groundwater (feet)	AF_D	AF_T	**AF_T**
7440-38-2	Arsenic	--	--	2.90E+01		2.43E-01	2.27E-01	1.42E+00	4.70E-01	170	25	11.02	2.85	3
7440-41-7	Beryllium	--	--	7.9E+02		2.43E-01	2.27E-01	1.42E+00	4.70E-01	4612	25	288.63	74.75	75
16065-83-	Chromium (trivalent)	--	--	1.8E+06		2.43E-01	2.27E-01	1.42E+00	4.70E-01	10506174	25	656636.24	170068.79	170069
7440-50-8	Copper	--	--	4.3E+02		2.43E-01	2.27E-01	1.42E+00	4.70E-01	2499	25	156.57	40.55	41

na = not available

An AF_T was not derived for chemicals that do not have promulgated primary MCLs. These chemicals were not included in the assessment of potential further degradation to groundwater quality.

AFT were calculated assuming that the depth between chemical impacts and groundwater is 25 feet and that the soil within this portion of the soil column is comprised of 37% sand, 51% silt, and 12% clay.

K_{oc} = soil organic carbon-water partition coefficient (L/kg)

f_{oc} = site-specific organic carbon content of soil (kg/kg)

K_d = soil-water partition coefficient (L/kg), K_{oc} x f_{oc}

H' = dimensionless Henry's law constant

O_w = site-specific average water-filled porosity (by volume)

O_a = site-specific average air-filled porosity (by volume)

Ot = site-specific average total porosity (by volume)

P_b = dry soil bulk density (kg/L)

[1] Obtained from EPA Region 9 preliminary remediation goal (PRG) physical-chemical data for volatile organic compounds, November 2000

[2] Obtained from Risk Assessment Information System (RAIS) Toxicity & Chemical-Specific Factors Data Base, January 2001, http://risk.lsd.ornl.gov/cgi-bin/tox/TOX_select?select=csf

[3] Site-specific average values

[4] Obtained from EPA Soil Screening Guidance: Technical Background Document (TBD), EPA/540/R-95/128, July 1996, http://www.epa.gov/oerrpage/superfund/resources/soil/toc.htm

Table B-7. Derivation of Soil Attenuation Factor for VOCs and Comparison of Maximum Soil Concentrations to Site-specific SSLs Calculated at 50 Feet Below Ground Surfac

CAS No.	Chemical	MCL (mg/L)	K_{oc} [1,2]	f_{oc} [3]	K_d [4,5]	H' [1]	O_w [3]	O_a [3]	P_b [3]	Max. Residual Soil Concentration (mg/kg)	AF at D=15'	Site-specific SSL (mg/kg) at AF = 1	Site-specific SSL (mg/kg) at AF at D=15'	Site-specific SSL (mg/kg) at AF at D=15' and DAF=20	Max > SSL fo at AF_T at D=15' and DAF=20?
7440-38-2	Arsenic	5.00E-02	--	4.05E-04	2.90E+01	--	2.4E-01	2.3E-01	1.42E+00	2.30E+01	2	1.46E+00	2.32E+00	4.63E+01	No
7440-41-7	Beryllium	4.00E-03	--	4.05E-04	7.9E+02	--	2.4E-01	2.3E-01	1.42E+00	4.10E-01	40	3.16E+00	1.25E+02	2.50E+03	No
117-81-7	Bis(2-ethylhexyl)phthalate	4.00E-03	1.5E+07	4.05E-04	--	4.2E-06	2.4E-01	2.3E-01	1.42E+00	1.30E-01	317	2.45E+01	7.75E+03	1.55E+05	No
16065-83-	Chromium (trivalent)	5.00E-02	--	4.05E-04	1.8E+06	--	2.4E-01	2.3E-01	1.42E+00	5.10E+01	89860	9.00E+04	8.09E+09	1.62E+11	No
7440-50-8	Copper	1.0E+00	--	4.05E-04	4.3E+02	--	2.4E-01	2.3E-01	1.42E+00	3.30E+01	22	4.28E+02	9.21E+03	1.84E+05	No
75-35-4	1,1-Dichloroethene (1,1-DCE)	6.00E-03	6.5E+01	4.05E-04	--	1.1E+00	2.4E-01	2.3E-01	1.42E+00	1.60E-01	2	2.24E-03	4.77E-03	9.55E-02	**Yes**
71-55-6	1,1,1-TCA	2.00E-01	1.4E+02	4.05E-04	--	7.1E-01	2.4E-01	2.3E-01	1.42E+00	1.50E-02	2	6.83E-02	1.45E-01	2.91E+00	No
79-01-€	Trichloroethene (TCE)	5.00E-03	9.4E+01	4.05E-04	--	4.2E-01	2.4E-01	2.3E-01	1.42E+00	1.10E-01	2	1.38E-03	2.94E-03	5.89E-02	**Yes**

An SSL was not derived for chemicals that do not have promulgated primary MCLs. These chemicals were not included in the assessment of potential degradation to groundwater quality.

AF = Average attenuation factor based on site lithology (distance to groundwater = 15 feet, 51% sand, 41% silt, and 8% clay).

na = not available
K_{oc} = soil organic carbon-water partition coefficient (L/kg)
f_{oc} = site-specific organic carbon content of soil (kg/kg)
K_d = soil-water partition coefficient (L/kg), $K_{oc} \times f_{oc}$
H' = dimensionless Henry's law constant
O_w = site-specific average water-filled porosity (by volume)
O_a = site-specific average air-filled porosity (by volume)
P_b = dry soil bulk density (kg/L)

[1] Obtained from EPA Region 9 preliminary remediation goal (PRG) physical-chemical data for volatile organic compounds, November 2000
[2] Obtained from Risk Assessment Information System (RAIS) Toxicity & Chemical-Specific Factors Data Base, January 2001, http://risk.lsd.ornl.gov/cgi-bin/tox/TOX_select?select=csf
[3] Site-specific average values
[4] Obtained from EPA Soil Screening Guidance: Technical Background Document (TBD), EPA/540/R-95/128, July 1996, http://www.epa.gov/oerrpage/superfund/resources/soil/toc.htm

Table B-8. Derivation of Soil Attenuation Factors for Non-VOCs at 50 Feet Below Ground Surface

CAS No.	Chemical	K_{oc} [1,2,4]	f_{oc} [3]	K_d [2,4]	H' [1]	O_w [3]	O_a [3]	P_b [3]	O_t	AF_{max}	Distance to Groundwater (feet)	AF_D	AF_T	**AF_T**
7440-38-2	Arsenic	--	--	2.90E+01		2.16E-01	2.85E-01	1.35E+00	5.01E-01	182	15	7.46	1.59	2
7440-41-7	Beryllium	--	--	7.9E+02		2.16E-01	2.85E-01	1.35E+00	5.01E-01	4939	15	185.82	39.58	40
117-81-7	Bis (2-ethylhexyl)phthalate	1.5E+07	4.20E-04	--	4.2E-06	2.16E-01	2.85E-01	1.35E+00	5.01E-01	39639	15	1487.07	316.75	317
16065-83-	Chromium (trivalent)	--	--	1.8E+06		2.16E-01	2.85E-01	1.35E+00	5.01E-01	11250001	15	421875.66	89859.52	89860
7440-50-8	Copper	--	--	4.3E+02		2.16E-01	2.85E-01	1.35E+00	5.01E-01	2676	15	100.98	21.51	22

na = not available

An AF_T was not derived for chemicals that do not have promulgated primary MCLs. These chemicals were not included in the assessment of potential furthe degradation to groundwater quality.

AFT were calculated assuming that the depth between chemical impacts and groundwater is 15 feet and that the soil within this portion of the soil column is comprised of 51% sand, 41% silt, and 8% clay.

K_{oc} = soil organic carbon-water partition coefficient (L/kg)

f_{oc} = site-specific organic carbon content of soil (kg/kg)

K_d = soil-water partition coefficient (L/kg), K_{oc} x f_{oc}

H' = dimensionless Henry's law constant

O_w = site-specific average water-filled porosity (by volume)

O_a = site-specific average air-filled porosity (by volume)

Ot = site-specific average total porosity (by volume)

P_b = dry soil bulk density (kg/L)

[1] Obtained from EPA Region 9 preliminary remediation goal (PRG) physical-chemical data for volatile organic compounds, November 2000

[2] Obtained from Risk Assessment Information System (RAIS) Toxicity & Chemical-Specific Factors Data Base, January 2001, http://risk.lsd.ornl.gov/cgi-bin/tox/TOX_select?select=csf

[3] Site-specific average values

[4] Obtained from EPA Soil Screening Guidance: Technical Background Document (TBD), EPA/540/R-95/128, July 1996, http://www.epa.gov/oerrpage/superfund/resources/soil/toc.htm

Table B-9
Summary of Risk Associated with VOC Vapor Migration from Groundwater

Chemical	Closest Groundwater Monitoring Well	Date Sampled	Groundwater Monitoring Well Concentration (mg/L)	Excess Cancer Risk	Estimated Hazard Index
Carbon disulfide	WCC-7S	Jan. 24, 2001	0.002	No Slope Factor	0.00000028
Chloroform	WCC-12S	Jan. 22, 2001	0.002	4.8×10^{-11}	0.000000082
1,1-DCA	WCC-12S	Jan. 22, 2001	0.018	1.5×10^{-10}	0.00000051
1,1-DCE	WCC-4S	Jan. 24, 2001	2	2.9×10^{-6}	0.0023
cis-1,2-DCE	WCC-11S	Jan. 23, 2001	0.009	No Slope Factor	0.0000027
trans-1,2-DCE	WCC-4S	Jan. 24, 2001	0.015	No Slope Factor	0.0000048
Toluene	WCC-7S	Jan. 24, 2001	0.009	No Slope Factor	0.00000058
1,1,2-TCA	WCC-7S	Jan. 24, 2001	0.0013	1.8×10^{-11}	0.00000022
TCE	WCC-4S	Jan. 24, 2001	1.1	3.1×10^{-8}	0.000050
Trichloro-fluoromethane	WCC-5S	Jan. 23, 2001	0.00052	No Slope Factor	0.00000021
1,2,4-Trimethyl-benzene	WCC-5S	Jan. 23, 2001	0.00021	No Slope Factor	0.00000050
1,3,5 Trimethyl-benzene	WCC-12S	Jan. 22, 2001	0.00051	No Slope Factor	0.0000017
Total				2.9×10^{-6}	0.0024

Table B-10. Derivation of Estimated Maximum VOC Concentrations in Groundwater at Parcel A Using a Site-specific SSL Equation

CAS No.	Chemical	Max. Residual Soil Concentration (mg/kg)	K_{oc} [1]	f_{oc} [2]	K_d [3]	H' [1]	O_w [2]	O_a [2]	P_b [2]	Pore Water Conc. (mg/L)	Groundwater Conc. (mg/L) = Pore Water Conc. / AF / DAF
75-34-3	1,1-DCA	6.00E-02	5.3E+01	4.05E-04	--	2.3E-01	2.4E-01	2.3E-01	1.42E+00	2.6E-01	1.3E-02
107-06-2	1,2-DCA	8.70E-03	3.8E+01	4.05E-04	--	4.0E-02	2.4E-01	2.3E-01	1.42E+00	4.5E-02	2.3E-03
75-35-4	1,1-DCE	9.00E-01	6.5E+01	4.05E-04	--	1.1E+00	2.4E-01	2.3E-01	1.42E+00	2.4E+00	1.2E-01
540-59-0	1,2-DCE	6.10E-03	3.7E+01	4.05E-04	--	2.9E+00	2.4E-01	2.3E-01	1.42E+00	9.5E-03	4.7E-04
156-59-2	cis-1,2-DCE	4.30E-02	3.6E+01	4.05E-04	--	1.7E-01	2.4E-01	2.3E-01	1.42E+00	2.0E-01	1.0E-02
127-18-4	PCE	2.02E-01	2.7E+02	4.05E-04	--	7.5E-01	2.4E-01	2.3E-01	1.42E+00	5.0E-01	2.5E-02
71-55-6	1,1,1-TCA	1.50E-02	1.4E+02	4.05E-04	--	7.1E-01	2.4E-01	2.3E-01	1.42E+00	4.4E-02	2.2E-03
79-00-5	1,1,2-TCA	1.80E-02	7.5E+01	4.05E-04	--	3.7E-02	2.4E-01	2.3E-01	1.42E+00	8.7E-02	4.3E-03
79-01-6	TCE	3.30E-01	9.4E+01	4.05E-04	--	4.2E-01	2.4E-01	2.3E-01	1.42E+00	1.2E+00	6.0E-02

K_{oc} = soil organic carbon-water partition coefficient (L/kg)

f_{oc} = organic carbon content of soil (kg/kg)

K_d = soil-water partition coefficient (L/kg), K_{oc} x f_{oc}

H' = dimensionless Henry's law constant

O_w = site-specific average water-filled porosity (by volume)

O_a = site-specific average air-filled porosity (by volume)

P_b = dry soil bulk density (kg/L)

[1] Obtained from EPA Region 9 preliminary remediation goal (PRG) physical-chemical data for volatile organic compounds, November 2000

[2] Site-specific average values

[3] Obtained from EPA Soil Screening Guidance: Technical Background Document (TBD), EPA/540/R-95/128, dated July 1996, http://www.epa.gov/oerrpage/superfund/resources/soil/toc.htm

Table B-11

Summary of Risk Associated with VOC Vapor Migration from Groundwater as a Result of Leachate Migrating into Groundwater

Chemical	Estimated Groundwater Concentration (mg/L)	Excess Cancer Risk	Estimated Hazard Index
1,1-DCA	0.013	1.1×10^{-10}	0.00000023
1,2-DCA	0.0023	5.4×10^{-11}	0.000000019
1,1-DCE	0.120	1.7×10^{-7}	0.00014
cis-1,2-DCE	0.010	No Slope Factor	0.0000030
PCE	0.025	2.4×10^{-9}	0.000032
1,1,1-TCA	0.0022	No Slope Factor	0.00000010
1,1,2-TCA	0.0043	5.9×10^{-11}	0.00000073
TCE	0.060	1.7×10^{-9}	0.0000027
Total		1.8×10^{-7}	0.00018

Table B-12. Summary of Cumulative Risks

	Onsite Construction Worker (Highest of AOPC 1 and AOPC 2)	Onsite Commercial/Industrial Worker (Highest of AOPC 1 and AOPC 2)	Onsite DTSC Commercial/Industrial Worker (Highest of AOPC 1 and AOPC 2)
Hazard Index			
Previously Estimated	0.051	0.000064	0.005
Vapor Migration from Groundwater	NA	0.0024	0.0024
Vapor Migration from Deep Soil			
Leachate and Subsequent			
Volatilization from Groundwater	NA	0.00018	0.00018
Total	0.051	0.0026	0.0072
Excess Cancer Risk			
Previously Estimated	1.4E-06	1.7E-10	4.4E-06
Vapor Migration from Groundwater	NA	2.9E-06	2.9E-06
Vapor Migration from Deep Soil			
Leachate and Subsequent			
Volatilization from Groundwater	NA	1.8E-07	1.8E-07
Total	1.4E-06	3.1E-06	7.5E-06

NA = Not applicable
AOPC = Area of Potential Concern (Two areas of potential concern were identified for Parcel A in the post-demolition risk assessment.)

Appendix C
Vapor Migration Model Results

SUMMARY OF VAPOR MIGRATION RESULTS - COMMERCIAL/LIGHT INDUSTRIAL SCENARIO
BRC Former C-6 Facility, Los Angeles, California

Groundwater

CAS No.	Chemical	Maximum Concentration in Groundwater (ug/L)	Cancer Risk	Hazard Index
75-15-0	Carbon disulfide	2	No Slope Factor	0.00000028
71-55-6	Chloroform	2	4.8E-11	0.000000082
75-34-3	1,1-Dichloroethane (1,1-DCA)	18	1.5E-10	0.00000051
75-34-3	1,1-Dichloroethylene (1,1-DCE)	2,000	2.9E-06	0.0023
156-59-2	cis-1,2-Dichloroethylene (cis 1,2-DCE)	9	No Slope Factor	0.0000027
156-60-5	trans-1,2-dichloroethene	15	No Slope Factor	0.0000048
108-88-3	Toluene	9	No Slope Factor	0.00000058
79-00-5	1,1,2-Trichloroethane	1.3	1.8E-11	0.00000022
79-01-6	Trichloroethlyene (TCE)	1,100	3.1E-08	0.000050
75-69-4	Trichlorofluoromethane	0.52	No Slope Factor	0.00000021
95-63-6	1,2,4 - Trimethylbenzene	0.21	No Slope Factor	0.00000050
108-67-8	1,3,5-Trimethylbenzene	0.51	No Slope Factor	0.0000017
	Total		2.9E-06	0.0024

Risk Calculations Version: November 1999

Project Name: BRC Former Boeing C-6 Facility, Los Angeles, California

Chemical: Carbon disulfide

Variable Descriptions				Units
CALCULATION OF SOIL GAS CONCENTRATION				
A. SOURCE - Free Product/Soil>100mg/kg.				
Mole fraction	MF	=	0.00E+00	dimensionless
Molecular weight	MW	=	7.60E+04	mg/mole
Vapor pressure	VP	=	4.72E-01	atm
Universal gas constant	R	=	8.20E-05	atm-m3/mole-K
Temperature	T	=	2.93E+02	K
Calculated soil gas concentration	**C_{sg}(fp)**	=	**0.00E+00**	**mg/m3**
B. SOURCE - Groundwater				
Water contamination level	C_w	=	2.00E+00	ug/l
Henry's Law Constant	H	=	1.20E+00	dimensionless
Calculated soil gas concentration	**C_{sg}(gw)**	=	**2.40E+00**	**mg/m3**
C. SOURCE - Soil < 100 mg/kg				
Soil contamination level	C_t	=		mg/kg
Henry's Law Constant	H	=	1.20E+00	dimensionless
Bulk density (dry)	ρ_b	=	1.50E+00	gm/cc
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Water-filled porosity	θ_w	=	1.50E-01	dimensionless
Weight fraction of organic carbon	f_{oc}	=	4.00E-03	dimensionless
Organic carbon partition coefficient	K_{oc}	=	4.60E+01	cm3/gm
Soil/water distribution coef.	K_d	=	**1.84E-01**	cm3/gm
Calculated soil gas concentration	**C_{sg}(s)**	=	**0.00E+00**	**mg/m3**
D. SOURCE - Measured Soil Gas				
Measured soil gas concentration	**C_{sg}(m)**	=		**mg/m3 (ug/l)**

E. SOIL GAS CONCENTRATION USED IN RISK CALCULATIONS >>>> 2.40E+00 mg/m3

DIFFUSIVE TRANSPORT UPWARD IN UNSATURATED ZONE				
Total porosity	θ	=	4.34E-01	dimensionless
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Diffusion coefficient in air	D_a	=	1.00E-01	cm2/sec
Effective diffusion coefficient	**D_e**	=	**8.03E-03**	cm2/sec
Depth of contamination or Csg	X	=	1.98E+01	m
Calculated Flux	**F_x**	=	**3.50E-04**	**mg/m2-hour**

Risk Calculations Version: November 1999

CALCULATING VAPOR CONCENTRATION IN BUILDING

A. INDOOR AIR COMPONENT

Floor area of building	A	=	9.68E+02	m2
% of floor area that flux occurs			1.00E+00	dimensionless
Attenuation factor(Crack factor)	S_b	=	1.00E-02	dimensionless
Flux area within building	Af	=	**9.68E+00**	m2
Interior Height of building	R_h	=	2.44E+00	m
Volume of building	V	=	**2.36E+03**	m3
Exchange rate of air	E	=	8.30E-01	exchanges/hr
Ventilation rate	Q	=	**1.96E+03**	m3/hr
Indoor air component	**C_i**	=	**1.73E-06**	**mg/m3**

B. OUTDOOR AIR COMPONENT

Downwind contamination length	L	=		m
Wind speed	u	=		m/hr
Height of building openings (or height of breathing zone)	h	=		m
Outdoor air component	**C_o**	=	**0.00E+00**	**mg/m3**
C. TOTAL INDOOR AIR CONCENTRATION	**C_t**	=	**1.73E-06**	**mg/m3**

EXPOSURE SCENARIO

Body weight	BW	=	7.00E+01	kg
Inhalation rate	IR	=	2.00E+01	m3/day
Exposure duration	ED	=	2.50E+01	yrs
Hours per day	conversion		8.00E+00	hr/day
Exposure time	ET	=	**3.33E-01**	hr/24 hours
Days per week	conversion		2.50E+00	days/week
Weeks per year	conversion		5.00E+01	weeks/yr
Exposure frequency	EF	=	**1.25E+02**	days/yr
Averaging Time (carc. risk)	AT	=	2.56E+04	days
Averaging Time (non-carc. risk)	AT	=	**9.13E+03**	days
Chemical Intake (carc. risk)	**IT_c**	=	**2.01E-08**	**mg/kg-day**
Chemical Intake (non-carc. risk)	**IT_{nc}**	=	**5.64E-08**	**mg/kg-day**

NON-CARCINOGENIC RISK (Chronic Risk)

Chemical Intake (non-carc. risk)	**IT_{nc}**	=	5.64E-08	mg/kg-day
Reference dose	RfD	=	2.00E-01	mg/kg-day
Hazard Index	**HI**	=	**2.82E-07**	

CARCINOGENIC RISK

Chemical Intake (carc. risk)	IT_c	=	2.01E-08	mg/kg-day
Slope factor (potency)	SF	=	0.00E+00	1/(mg/kg-day)
Cancer Risk	**Risk**	=	**No Slope Factor**	

Risk Calculations Version: November 1999

Project Name: BRC Former Boeing C-6 Facility, Los Angeles, California

Chemical: Chloroform

Variable Descriptions				Units
CALCULATION OF SOIL GAS CONCENTRATION				
A. SOURCE - Free Product/Soil>100mg/kg.				
Mole fraction	MF	=	0.00E+00	dimensionless
Molecular weight	MW	=	1.20E+05	mg/mole
Vapor pressure	VP	=	2.59E-01	atm
Universal gas constant	R	=	8.20E-05	atm-m3/mole-K
Temperature	T	=	2.93E+02	K
Calculated soil gas concentration	**C_{sg}(fp)**	=	**0.00E+00**	**mg/m3**
B. SOURCE - Groundwater				
Water contamination level	C_w	=	2.00E+00	ug/l
Henry's Law Constant	H	=	1.50E-01	dimensionless
Calculated soil gas concentration	**C_{sg}(gw)**	=	**3.00E-01**	**mg/m3**
C. SOURCE - Soil < 100 mg/kg				
Soil contamination level	C_t	=		mg/kg
Henry's Law Constant	H	=	1.50E-01	dimensionless
Bulk density (dry)	ρ_b	=	1.50E+00	gm/cc
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Water-filled porosity	θ_w	=	1.50E-01	dimensionless
Weight fraction of organic carbon	f_{oc}	=	4.00E-03	dimensionless
Organic carbon partition coefficient	K_{oc}	=	5.30E+01	cm3/gm
Soil/water distribution coef.	K_d	=	**2.12E-01**	cm3/gm
Calculated soil gas concentration	**C_{sg}(s)**	=	**0.00E+00**	**mg/m3**
D. SOURCE - Measured Soil Gas				
Measured soil gas concentration	**C_{sg}(m)**	=		**mg/m3 (ug/l)**

E. SOIL GAS CONCENTRATION USED IN RISK CALCULATIONS >>>> 3.00E-01 mg/m3

DIFFUSIVE TRANSPORT UPWARD IN UNSATURATED ZONE				
Total porosity	θ	=	4.34E-01	dimensionless
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Diffusion coefficient in air	D_a	=	1.00E-01	cm2/sec
Effective diffusion coefficient	**D_e**	=	**8.03E-03**	cm2/sec
Depth of contamination or Csg	X	=	1.98E+01	m
Calculated Flux	**F_x**	=	**4.38E-05**	**mg/m2-hour**

CALCULATING VAPOR CONCENTRATION IN BUILDING

A. INDOOR AIR COMPONENT

Floor area of building	A	=	9.68E+02	m2
% of floor area that flux occurs			1.00E+00	dimensionless
Attenuation factor(Crack factor)	S_b	=	1.00E-02	dimensionless
Flux area within building	Af	=	**9.68E+00**	m2
Interior Height of building	R_h	=	2.44E+00	m
Volume of building	V	=	**2.36E+03**	m3
Exchange rate of air	E	=	8.30E-01	exchanges/hr
Ventilation rate	Q	=	**1.96E+03**	m3/hr
Indoor air component	**C_i**	=	**2.16E-07**	**mg/m3**

B. OUTDOOR AIR COMPONENT

Downwind contamination length	L	=	0.00E+00	m
Wind speed	u	=	0.00E+00	m/hr
Height of building openings (or height of breathing zone)	h	=	0.00E+00	m
Outdoor air component	**C_o**	=	**0.00E+00**	**mg/m3**

C. TOTAL INDOOR AIR CONCENTRATION C_t = **2.16E-07** **mg/m3**

EXPOSURE SCENARIO

Body weight	BW	=	7.00E+01	kg
Inhalation rate	IR	=	2.00E+01	m3/day
Exposure duration	ED	=	2.50E+01	yrs
Hours per day	conversion		8.00E+00	hr/day
Exposure time	ET	=	**3.33E-01**	hr/24 hours
Days per week	conversion		2.50E+00	days/week
Weeks per year	conversion		5.00E+01	weeks/yr
Exposure frequency	EF	=	**1.25E+02**	days/yr
Averaging Time (carc. risk)	AT	=	2.56E+04	days
Averaging Time (non-carc. risk)	AT	=	**9.13E+03**	days
Chemical Intake (carc. risk)	**IT_c**	=	**2.51E-09**	**mg/kg-day**
Chemical Intake (non-carc. risk)	**IT_{nc}**	=	**7.05E-09**	**mg/kg-day**

NON-CARCINOGENIC RISK (Chronic Risk)

Chemical Intake (non-carc. risk)	**IT_{nc}**	=	7.05E-09	mg/kg-day
Reference dose	RfD	=	8.60E-02	mg/kg-day
Hazard Index	**HI**	=	**8.19E-08**	

CARCINOGENIC RISK

Chemical Intake (carc. risk)	IT_c	=	2.51E-09	mg/kg-day
Slope factor (potency)	SF	=	1.90E-02	1/(mg/kg-day)
Cancer Risk	**Risk**	=	**4.77E-11**	

Risk Calculations Version: November 1999

Project Name: BRC Former Boeing C-6 Facility, Los Angeles, California

Chemical: 1,1 - Dichloroethane (1,1-DCA)

Variable Descriptions				Units
CALCULATION OF SOIL GAS CONCENTRATION				
A. SOURCE - Free Product/Soil>100mg/kg.				
Mole fraction	MF	=	0.00E+00	dimensionless
Molecular weight	MW	=	9.90E+04	mg/mole
Vapor pressure	VP	=	3.08E-01	atm
Universal gas constant	R	=	8.20E-05	atm-m3/mole-K
Temperature	T	=	2.93E+02	K
Calculated soil gas concentration	**C_{sg}(fp)**	=	**0.00E+00**	**mg/m3**
B. SOURCE - Groundwater				
Water contamination level	C_w	=	1.80E+01	ug/l
Henry's Law Constant	H	=	2.30E-01	dimensionless
Calculated soil gas concentration	**C_{sg}(gw)**	=	**4.14E+00**	**mg/m3**
C. SOURCE - Soil < 100 mg/kg				
Soil contamination level	C_t	=		mg/kg
Henry's Law Constant	H	=	2.30E-01	dimensionless
Bulk density (dry)	ρ_b	=	1.50E+00	gm/cc
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Water-filled porosity	θ_w	=	1.50E-01	dimensionless
Weight fraction of organic carbon	f_{oc}	=	4.00E-03	dimensionless
Organic carbon partition coefficient	K_{oc}	=	5.30E+01	cm3/gm
Soil/water distribution coef.	K_d	=	**2.12E-01**	cm3/gm
Calculated soil gas concentration	**C_{sg}(s)**	=	**0.00E+00**	**mg/m3**
D. SOURCE - Measured Soil Gas				
Measured soil gas concentration	**C_{sg}(m)**	=		**mg/m3 (ug/l)**

E. SOIL GAS CONCENTRATION USED IN RISK CALCULATIONS >>>> 4.14E+00 mg/m3

DIFFUSIVE TRANSPORT UPWARD IN UNSATURATED ZONE				
Total porosity	θ	=	4.34E-01	dimensionless
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Diffusion coefficient in air	D_a	=	7.40E-02	cm2/sec
Effective diffusion coefficient	**D_e**	=	**5.94E-03**	cm2/sec
Depth of contamination or Csg	X	=	1.98E+01	m
Calculated Flux	**F_x**	=	**4.47E-04**	**mg/m2-hour**

Risk Calculations Version: November 1999

CALCULATING VAPOR CONCENTRATION IN BUILDING

A. INDOOR AIR COMPONENT

Floor area of building	A	=	9.68E+02	m2
% of floor area that flux occurs			1.00E+00	dimensionless
Attenuation factor(Crack factor)	S_b	=	1.00E-02	dimensionless
Flux area within building	Af	=	**9.68E+00**	m2
Interior Height of building	R_h	=	2.44E+00	m
Volume of building	V	=	**2.36E+03**	m3
Exchange rate of air	E	=	8.30E-01	exchanges/hr
Ventilation rate	Q	=	**1.96E+03**	m3/hr
Indoor air component	**C_i**	=	**2.21E-06**	**mg/m3**

B. OUTDOOR AIR COMPONENT

Downwind contamination length	L	=		m
Wind speed	u	=		m/hr
Height of building openings (or height of breathing zone)	h	=		m
Outdoor air component	**C_o**	=	**0.00E+00**	**mg/m3**
C. TOTAL INDOOR AIR CONCENTRATION	**C_t**	=	**2.21E-06**	**mg/m3**

EXPOSURE SCENARIO

Body weight	BW	=	7.00E+01	kg
Inhalation rate	IR	=	2.00E+01	m3/day
Exposure duration	ED	=	2.50E+01	yrs
Hours per day	conversion		8.00E+00	hr/day
Exposure time	ET	=	**3.33E-01**	hr/24 hours
Days per week	conversion		2.50E+00	days/week
Weeks per year	conversion		5.00E+01	weeks/yr
Exposure frequency	EF	=	**1.25E+02**	days/yr
Averaging Time (carc. risk)	AT	=	2.56E+04	days
Averaging Time (non-carc. risk)	AT	=	**9.13E+03**	days
Chemical Intake (carc. risk)	**IT_c**	=	**2.57E-08**	**mg/kg-day**
Chemical Intake (non-carc. risk)	**IT_{nc}**	=	**7.20E-08**	**mg/kg-day**

NON-CARCINOGENIC RISK (Chronic Risk)

Chemical Intake (non-carc. risk)	**IT_{nc}**	=	7.20E-08	mg/kg-day
Reference dose	RfD	=	1.40E-01	mg/kg-day
Hazard Index	**HI**	=	**5.14E-07**	

CARCINOGENIC RISK

Chemical Intake (carc. risk)	IT_c	=	2.57E-08	mg/kg-day
Slope factor (potency)	SF	=	5.70E-03	1/(mg/kg-day)
Cancer Risk	**Risk**	=	**1.46E-10**	

Risk Calculations Version: November 1999

Project Name: BRC Former Boeing C-6 Facility, Los Angeles, California

Chemical: 1,1-Dichloroethylene (1,1-DCE)

Variable Descriptions				Units
CALCULATION OF SOIL GAS CONCENTRATION				
A. SOURCE - Free Product/Soil>100mg/kg.				
Mole fraction	MF	=	0.00E+00	dimensionless
Molecular weight	MW	=	9.70E+04	mg/mole
Vapor pressure	VP	=	7.78E-01	atm
Universal gas constant	R	=	8.20E-05	atm-m3/mole-K
Temperature	T	=	2.93E+02	K
Calculated soil gas concentration	**C_{sg}(fp)**	=	**0.00E+00**	**mg/m3**
B. SOURCE - Groundwater				
Water contamination level	C_w	=	2.00E+03	ug/l
Henry's Law Constant	H	=	1.10E+00	dimensionless
Calculated soil gas concentration	**C_{sg}(gw)**	=	**2.20E+03**	**mg/m3**
C. SOURCE - Soil < 100 mg/kg				
Soil contamination level	C_t	=		mg/kg
Henry's Law Constant	H	=	1.10E+00	dimensionless
Bulk density (dry)	ρ_b	=	1.50E+00	gm/cc
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Water-filled porosity	θ_w	=	1.50E-01	dimensionless
Weight fraction of organic carbon	f_{oc}	=	4.00E-03	dimensionless
Organic carbon partition coefficient	K_{oc}	=	6.50E+01	cm3/gm
Soil/water distribution coef.	K_d	=	**2.60E-01**	cm3/gm
Calculated soil gas concentration	**C_{sg}(s)**	=	**0.00E+00**	**mg/m3**
D. SOURCE - Measured Soil Gas				
Measured soil gas concentration	**C_{sg}(m)**	=		**mg/m3 (ug/l)**

E. SOIL GAS CONCENTRATION USED IN RISK CALCULATIONS >>>> 2.20E+03 mg/m3

DIFFUSIVE TRANSPORT UPWARD IN UNSATURATED ZONE				
Total porosity	θ	=	4.34E-01	dimensionless
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Diffusion coefficient in air	D_a	=	9.00E-02	cm2/sec
Effective diffusion coefficient	**D_e**	=	**7.22E-03**	cm2/sec
Depth of contamination or Csg	X	=	1.98E+01	m
Calculated Flux	**F_x**	=	**2.89E-01**	**mg/m2-hour**

CALCULATING VAPOR CONCENTRATION IN BUILDING

A. INDOOR AIR COMPONENT

Floor area of building	A	=	9.68E+02	m2
% of floor area that flux occurs			1.00E+00	dimensionless
Attenuation factor(Crack factor)	S_b	=	1.00E-02	dimensionless
Flux area within building	Af	=	**9.68E+00**	m2
Interior Height of building	R_h	=	2.44E+00	m
Volume of building	V	=	**2.36E+03**	m3
Exchange rate of air	E	=	8.30E-01	exchanges/hr
Ventilation rate	Q	=	**1.96E+03**	m3/hr
Indoor air component	**C_i**	=	**1.43E-03**	**mg/m3**

B. OUTDOOR AIR COMPONENT

Downwind contamination length	L	=		m
Wind speed	u	=		m/hr
Height of building openings (or height of breathing zone)	h	=		m
Outdoor air component	**C_o**	=	**0.00E+00**	**mg/m3**
C. TOTAL INDOOR AIR CONCENTRATION	**C_t**	=	**1.43E-03**	**mg/m3**

EXPOSURE SCENARIO

Body weight	BW	=	7.00E+01	kg
Inhalation rate	IR	=	2.00E+01	m3/day
Exposure duration	ED	=	2.50E+01	yrs
Hours per day	conversion		8.00E+00	hr/day
Exposure time	ET	=	**3.33E-01**	hr/24 hours
Days per week	conversion		2.50E+00	days/week
Weeks per year	conversion		5.00E+01	weeks/yr
Exposure frequency	EF	=	**1.25E+02**	days/yr
Averaging Time (carc. risk)	AT	=	2.56E+04	days
Averaging Time (non-carc. risk)	AT	=	**9.13E+03**	days
Chemical Intake (carc. risk)	**IT_c**	=	**1.66E-05**	**mg/kg-day**
Chemical Intake (non-carc. risk)	**IT_{nc}**	=	**4.65E-05**	**mg/kg-day**

NON-CARCINOGENIC RISK (Chronic Risk)

Chemical Intake (non-carc. risk)	**IT_{nc}**	=	4.65E-05	mg/kg-day
Reference dose	RfD	=	2.00E-02	mg/kg-day
Hazard Index	**HI**	=	**2.33E-03**	

CARCINOGENIC RISK

Chemical Intake (carc. risk)	IT_c	=	1.66E-05	mg/kg-day
Slope factor (potency)	SF	=	1.75E-01	1/(mg/kg-day)
Cancer Risk	**Risk**	=	**2.90E-06**	

Risk Calculations Version: November 1999

Project Name: BRC Former Boeing C-6 Facility, Los Angeles, California

Chemical: cis-1,2-Dichloroethylene (cis 1,2-DCE)

Variable Descriptions				Units
CALCULATION OF SOIL GAS CONCENTRATION				
A. SOURCE - Free Product/Soil>100mg/kg.				
Mole fraction	MF	=	0.00E+00	dimensionless
Molecular weight	MW	=	9.70E+04	mg/mole
Vapor pressure	VP	=	2.40E-04	atm
Universal gas constant	R	=	8.20E-05	atm-m3/mole-K
Temperature	T	=	2.93E+02	K
Calculated soil gas concentration	**C_{sg}(fp)**	=	**0.00E+00**	**mg/m3**
B. SOURCE - Groundwater				
Water contamination level	C_w	=	9.00E+00	ug/l
Henry's Law Constant	H	=	1.70E-01	dimensionless
Calculated soil gas concentration	**C_{sg}(gw)**	=	**1.53E+00**	**mg/m3**
C. SOURCE - Soil < 100 mg/kg				
Soil contamination level	C_t	=		mg/kg
Henry's Law Constant	H	=	1.70E-01	dimensionless
Bulk density (dry)	ρ_b	=	1.50E+00	gm/cc
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Water-filled porosity	θ_w	=	1.50E-01	dimensionless
Weight fraction of organic carbon	f_{oc}	=	4.00E-03	dimensionless
Organic carbon partition coefficient	K_{oc}	=	3.60E+01	cm3/gm
Soil/water distribution coef.	K_d	=	**1.44E-01**	cm3/gm
Calculated soil gas concentration	**C_{sg}(s)**	=	**0.00E+00**	**mg/m3**
D. SOURCE - Measured Soil Gas				
Measured soil gas concentration	**C_{sg}(m)**	=		**mg/m3 (ug/l)**

E. SOIL GAS CONCENTRATION USED IN RISK CALCULATIONS >>>> 1.53E+00 mg/m3

DIFFUSIVE TRANSPORT UPWARD IN UNSATURATED ZONE				
Total porosity	θ	=	4.34E-01	dimensionless
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Diffusion coefficient in air	D_a	=	7.40E-02	cm2/sec
Effective diffusion coefficient	**D_e**	=	**5.94E-03**	cm2/sec
Depth of contamination or Csg	X	=	1.98E+01	m
Calculated Flux	**F_x**	=	**1.65E-04**	**mg/m2-hour**

Risk Calculations Version: November 1999

CALCULATING VAPOR CONCENTRATION IN BUILDING

A. INDOOR AIR COMPONENT

Floor area of building	A	=	9.68E+02	m2
% of floor area that flux occurs			1.00E+00	dimensionless
Attenuation factor(Crack factor)	S_b	=	1.00E-02	dimensionless
Flux area within building	Af	=	**9.68E+00**	m2
Interior Height of building	R_h	=	2.44E+00	m
Volume of building	V	=	**2.36E+03**	m3
Exchange rate of air	E	=	8.30E-01	exchanges/hr
Ventilation rate	Q	=	**1.96E+03**	m3/hr
Indoor air component	**C_i**	=	**8.15E-07**	**mg/m3**

B. OUTDOOR AIR COMPONENT

Downwind contamination length	L	=		m
Wind speed	u	=		m/hr
Height of building openings (or height of breathing zone)	h	=		m
Outdoor air component	**C_o**	=	**0.00E+00**	**mg/m3**
C. TOTAL INDOOR AIR CONCENTRATION	**C_t**	=	**8.15E-07**	**mg/m3**

EXPOSURE SCENARIO

Body weight	BW	=	7.00E+01	kg
Inhalation rate	IR	=	2.00E+01	m3/day
Exposure duration	ED	=	2.50E+01	yrs
Hours per day	conversion		8.00E+00	hr/day
Exposure time	ET	=	**3.33E-01**	hr/24 hours
Days per week	conversion		2.50E+00	days/week
Weeks per year	conversion		5.00E+01	weeks/yr
Exposure frequency	EF	=	**1.25E+02**	days/yr
Averaging Time (carc. risk)	AT	=	2.56E+04	days
Averaging Time (non-carc. risk)	AT	=	**9.13E+03**	days
Chemical Intake (carc. risk)	**IT_c**	=	**9.48E-09**	**mg/kg-day**
Chemical Intake (non-carc. risk)	**IT_{nc}**	=	**2.66E-08**	**mg/kg-day**

NON-CARCINOGENIC RISK (Chronic Risk)

Chemical Intake (non-carc. risk)	**IT_{nc}**	=	2.66E-08	mg/kg-day
Reference dose	RfD	=	1.00E-02	mg/kg-day
Hazard Index	**HI**	=	**2.66E-06**	

CARCINOGENIC RISK

Chemical Intake (carc. risk)	IT_c	=	9.48E-09	mg/kg-day
Slope factor (potency)	SF	=	0.00E+00	1/(mg/kg-day)
Cancer Risk	**Risk**	=	**No Slope Factor**	

Risk Calculations Version: November 1999

Project Name: BRC Former Boeing C-6 Facility, Los Angeles, California

Chemical: trans-1,2-Dichloroethylene (trans-1,2-DCE)

Variable Descriptions				Units
CALCULATION OF SOIL GAS CONCENTRATION				
A. SOURCE - Free Product/Soil>100mg/kg.				
Mole fraction	MF	=	0.00E+00	dimensionless
Molecular weight	MW	=	9.70E+04	mg/mole
Vapor pressure	VP	=	7.61E-02	atm
Universal gas constant	R	=	8.20E-05	atm-m3/mole-K
Temperature	T	=	2.93E+02	K
Calculated soil gas concentration	**C_{sg}(fp)**	=	**0.00E+00**	**mg/m3**
B. SOURCE - Groundwater				
Water contamination level	C_w	=	1.50E+01	ug/l
Henry's Law Constant	H	=	3.80E-01	dimensionless
Calculated soil gas concentration	**C_{sg}(gw)**	=	**5.70E+00**	**mg/m3**
C. SOURCE - Soil < 100 mg/kg				
Soil contamination level	C_t	=		mg/kg
Henry's Law Constant	H	=	3.80E-01	dimensionless
Bulk density (dry)	ρ_b	=	1.50E+00	gm/cc
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Water-filled porosity	θ_w	=	1.50E-01	dimensionless
Weight fraction of organic carbon	f_{oc}	=	4.00E-03	dimensionless
Organic carbon partition coefficient	K_{oc}	=	3.80E+01	cm3/gm
Soil/water distribution coef.	K_d	=	**1.52E-01**	cm3/gm
Calculated soil gas concentration	**C_{sg}(s)**	=	**0.00E+00**	**mg/m3**
D. SOURCE - Measured Soil Gas				
Measured soil gas concentration	**C_{sg}(m)**	=		**mg/m3 (ug/l)**

E. SOIL GAS CONCENTRATION USED IN RISK CALCULATIONS >>>> 5.70E+00 mg/m3

DIFFUSIVE TRANSPORT UPWARD IN UNSATURATED ZONE				
Total porosity	θ	=	4.34E-01	dimensionless
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Diffusion coefficient in air	D_a	=	7.10E-02	cm2/sec
Effective diffusion coefficient	**D_e**	=	**5.70E-03**	cm2/sec
Depth of contamination or Csg	X	=	1.98E+01	m
Calculated Flux	**F_x**	=	**5.90E-04**	**mg/m2-hour**

Risk Calculations Version: November 1999

CALCULATING VAPOR CONCENTRATION IN BUILDING

A. INDOOR AIR COMPONENT

Floor area of building	A	=	9.68E+02	m2
% of floor area that flux occurs			1.00E+00	dimensionless
Attenuation factor(Crack factor)	S_b	=	1.00E-02	dimensionless
Flux area within building	Af	=	**9.68E+00**	m2
Interior Height of building	R_h	=	2.44E+00	m
Volume of building	V	=	**2.36E+03**	m3
Exchange rate of air	E	=	8.30E-01	exchanges/hr
Ventilation rate	Q	=	**1.96E+03**	m3/hr
Indoor air component	**C_i**	=	**2.91E-06**	**mg/m3**

B. OUTDOOR AIR COMPONENT

Downwind contamination length	L	=		m
Wind speed	u	=		m/hr
Height of building openings (or height of breathing zone)	h	=		m
Outdoor air component	**C_o**	=	**0.00E+00**	**mg/m3**
C. TOTAL INDOOR AIR CONCENTRATION	**C_t**	=	**2.91E-06**	**mg/m3**

EXPOSURE SCENARIO

Body weight	BW	=	7.00E+01	kg
Inhalation rate	IR	=	2.00E+01	m3/day
Exposure duration	ED	=	2.50E+01	yrs
Hours per day	conversion		8.00E+00	hr/day
Exposure time	ET	=	**3.33E-01**	hr/24 hours
Days per week	conversion		2.50E+00	days/week
Weeks per year	conversion		5.00E+01	weeks/yr
Exposure frequency	EF	=	**1.25E+02**	days/yr
Averaging Time (carc. risk)	AT	=	2.56E+04	days
Averaging Time (non-carc. risk)	AT	=	**9.13E+03**	days
Chemical Intake (carc. risk)	**IT_c**	=	**3.39E-08**	**mg/kg-day**
Chemical Intake (non-carc. risk)	**IT_{nc}**	=	**9.51E-08**	**mg/kg-day**

NON-CARCINOGENIC RISK (Chronic Risk)

Chemical Intake (non-carc. risk)	**IT_{nc}**	=	9.51E-08	mg/kg-day
Reference dose	RfD	=	2.00E-02	mg/kg-day
Hazard Index	**HI**	=	**4.75E-06**	

CARCINOGENIC RISK

Chemical Intake (carc. risk)	IT_c	=	3.39E-08	mg/kg-day
Slope factor (potency)	SF	=	0.00E+00	1/(mg/kg-day)
Cancer Risk	**Risk**	=	**No Slope Factor**	

Risk Calculations Version: November 1999

Project Name: BRC Former Boeing C-6 Facility, Los Angeles, California

Chemical: Toluene

Variable Descriptions				Units
CALCULATION OF SOIL GAS CONCENTRATION				
A. SOURCE - Free Product/Soil>100mg/kg.				
Mole fraction	MF	=	0.00E+00	dimensionless
Molecular weight	MW	=	9.20E+04	mg/mole
Vapor pressure	VP	=	3.74E-02	atm
Universal gas constant	R	=	8.20E-05	atm-m3/mole-K
Temperature	T	=	2.93E+02	K
Calculated soil gas concentration	**C_{sg}(fp)**	=	**0.00E+00**	**mg/m3**
B. SOURCE - Groundwater				
Water contamination level	C_w	=	9.00E+00	ug/l
Henry's Law Constant	H	=	2.70E-01	dimensionless
Calculated soil gas concentration	**C_{sg}(gw)**	=	**2.43E+00**	**mg/m3**
C. SOURCE - Soil < 100 mg/kg				
Soil contamination level	C_t	=		mg/kg
Henry's Law Constant	H	=	2.70E-01	dimensionless
Bulk density (dry)	ρ_b	=	1.50E+00	gm/cc
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Water-filled porosity	θ_w	=	1.50E-01	dimensionless
Weight fraction of organic carbon	f_{oc}	=	4.00E-03	dimensionless
Organic carbon partition coefficient	K_{oc}	=	1.40E+02	cm3/gm
Soil/water distribution coef.	K_d	=	**5.60E-01**	cm3/gm
Calculated soil gas concentration	**C_{sg}(s)**	=	**0.00E+00**	**mg/m3**
D. SOURCE - Measured Soil Gas				
Measured soil gas concentration	**C_{sg}(m)**	=		**mg/m3 (ug/l)**

E. SOIL GAS CONCENTRATION USED IN RISK CALCULATIONS >>>> 2.43E+00 mg/m3

DIFFUSIVE TRANSPORT UPWARD IN UNSATURATED ZONE				
Total porosity	θ	=	4.34E-01	dimensionless
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Diffusion coefficient in air	D_a	=	8.70E-02	cm2/sec
Effective diffusion coefficient	**D_e**	=	**6.98E-03**	cm2/sec
Depth of contamination or Csg	X	=	1.98E+01	m
Calculated Flux	**F_x**	=	**3.08E-04**	**mg/m2-hour**

Risk Calculations Version: November 1999

CALCULATING VAPOR CONCENTRATION IN BUILDING

A. INDOOR AIR COMPONENT

Floor area of building	A	=	9.68E+02	m2
% of floor area that flux occurs			1.00E+00	dimensionless
Attenuation factor(Crack factor)	S_b	=	1.00E-02	dimensionless
Flux area within building	Af	=	**9.68E+00**	m2
Interior Height of building	R_h	=	2.44E+00	m
Volume of building	V	=	**2.36E+03**	m3
Exchange rate of air	E	=	8.30E-01	exchanges/hr
Ventilation rate	Q	=	**1.96E+03**	m3/hr
Indoor air component	**C_i**	=	**1.52E-06**	**mg/m3**

B. OUTDOOR AIR COMPONENT

Downwind contamination length	L	=		m
Wind speed	u	=		m/hr
Height of building openings (or height of breathing zone)	h	=		m
Outdoor air component	**C_o**	=	**0.00E+00**	**mg/m3**
C. TOTAL INDOOR AIR CONCENTRATION	**C_t**	=	**1.52E-06**	**mg/m3**

EXPOSURE SCENARIO

Body weight	BW	=	7.00E+01	kg
Inhalation rate	IR	=	2.00E+01	m3/day
Exposure duration	ED	=	2.50E+01	yrs
Hours per day	conversion		8.00E+00	hr/day
Exposure time	ET	=	**3.33E-01**	hr/24 hours
Days per week	conversion		2.50E+00	days/week
Weeks per year	conversion		5.00E+01	weeks/yr
Exposure frequency	EF	=	**1.25E+02**	days/yr
Averaging Time (carc. risk)	AT	=	2.56E+04	days
Averaging Time (non-carc. risk)	AT	=	**9.13E+03**	days
Chemical Intake (carc. risk)	**IT_c**	=	**1.77E-08**	**mg/kg-day**
Chemical Intake (non-carc. risk)	**IT_{nc}**	=	**4.97E-08**	**mg/kg-day**

NON-CARCINOGENIC RISK (Chronic Risk)

Chemical Intake (non-carc. risk)	**IT_{nc}**	=	4.97E-08	mg/kg-day
Reference dose	RfD	=	8.57E-02	mg/kg-day
Hazard Index	**HI**	=	**5.79E-07**	

CARCINOGENIC RISK

Chemical Intake (carc. risk)	IT_c	=	1.77E-08	mg/kg-day
Slope factor (potency)	SF	=	0.00E+00	1/(mg/kg-day)
Cancer Risk	**Risk**	=	**No Slope Factor**	

Risk Calculations Version: November 1999

Project Name: BRC Former Boeing C-6 Facility, Los Angeles, California

Chemical: 1,1,2 - TCA

Variable Descriptions				Units
CALCULATION OF SOIL GAS CONCENTRATION				
A. SOURCE - Free Product/Soil>100mg/kg.				
Mole fraction	MF	=	0.00E+00	dimensionless
Molecular weight	MW	=	1.30E+05	mg/mole
Vapor pressure	VP	=	3.10E-02	atm
Universal gas constant	R	=	8.20E-05	atm-m3/mole-K
Temperature	T	=	2.93E+02	K
Calculated soil gas concentration	**C_{sg}(fp)**	=	**0.00E+00**	**mg/m3**
B. SOURCE - Groundwater				
Water contamination level	C_w	=	1.30E+00	ug/l
Henry's Law Constant	H	=	3.70E-02	dimensionless
Calculated soil gas concentration	**C_{sg}(gw)**	=	**4.81E-02**	**mg/m3**
C. SOURCE - Soil < 100 mg/kg				
Soil contamination level	C_t	=		mg/kg
Henry's Law Constant	H	=	3.70E-02	dimensionless
Bulk density (dry)	ρ_b	=	1.50E+00	gm/cc
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Water-filled porosity	θ_w	=	1.50E-01	dimensionless
Weight fraction of organic carbon	f_{oc}	=	4.00E-03	dimensionless
Organic carbon partition coefficient	K_{oc}	=	7.50E+01	cm3/gm
Soil/water distribution coef.	K_d	=	**3.00E-01**	cm3/gm
Calculated soil gas concentration	**C_{sg}(s)**	=	**0.00E+00**	**mg/m3**
D. SOURCE - Measured Soil Gas				
Measured soil gas concentration	**C_{sg}(m)**	=		**mg/m3 (ug/l)**

E. SOIL GAS CONCENTRATION USED IN RISK CALCULATIONS >>>> 4.81E-02 mg/m3

DIFFUSIVE TRANSPORT UPWARD IN UNSATURATED ZONE				
Total porosity	θ	=	4.34E-01	dimensionless
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Diffusion coefficient in air	D_a	=	7.80E-02	cm2/sec
Effective diffusion coefficient	**D_e**	=	**6.26E-03**	cm2/sec
Depth of contamination or Csg	X	=	1.98E+01	m
Calculated Flux	**F_x**	=	**5.47E-06**	**mg/m2-hour**

Risk Calculations Version: November 1999

CALCULATING VAPOR CONCENTRATION IN BUILDING

A. INDOOR AIR COMPONENT

Floor area of building	A	=	9.68E+02	m2
% of floor area that flux occurs			1.00E+00	dimensionless
Attenuation factor(Crack factor)	S_b	=	1.00E-02	dimensionless
Flux area within building	Af	=	**9.68E+00**	m2
Interior Height of building	R_h	=	2.44E+00	m
Volume of building	V	=	**2.36E+03**	m3
Exchange rate of air	E	=	8.30E-01	exchanges/hr
Ventilation rate	Q	=	**1.96E+03**	m3/hr
Indoor air component	**C_i**	=	**2.70E-08**	**mg/m3**

B. OUTDOOR AIR COMPONENT

Downwind contamination length	L	=		m
Wind speed	u	=		m/hr
Height of building openings (or height of breathing zone)	h	=		m
Outdoor air component	**C_o**	=	**0.00E+00**	**mg/m3**
C. TOTAL INDOOR AIR CONCENTRATION	**C_t**	=	**2.70E-08**	**mg/m3**

EXPOSURE SCENARIO

Body weight	BW	=	7.00E+01	kg
Inhalation rate	IR	=	2.00E+01	m3/day
Exposure duration	ED	=	2.50E+01	yrs
Hours per day	conversion		8.00E+00	hr/day
Exposure time	ET	=	**3.33E-01**	hr/24 hours
Days per week	conversion		2.50E+00	days/week
Weeks per year	conversion		5.00E+01	weeks/yr
Exposure frequency	EF	=	**1.25E+02**	days/yr
Averaging Time (carc. risk)	AT	=	2.56E+04	days
Averaging Time (non-carc. risk)	AT	=	**9.13E+03**	days
Chemical Intake (carc. risk)	**IT_c**	=	**3.14E-10**	**mg/kg-day**
Chemical Intake (non-carc. risk)	**IT_{nc}**	=	**8.81E-10**	**mg/kg-day**

NON-CARCINOGENIC RISK (Chronic Risk)

Chemical Intake (non-carc. risk)	**IT_{nc}**	=	8.81E-10	mg/kg-day
Reference dose	RfD	=	4.00E-03	mg/kg-day
Hazard Index	**HI**	=	**2.20E-07**	

CARCINOGENIC RISK

Chemical Intake (carc. risk)	IT_c	=	3.14E-10	mg/kg-day
Slope factor (potency)	SF	=	5.70E-02	1/(mg/kg-day)
Cancer Risk	**Risk**	=	**1.79E-11**	

Risk Calculations Version: November 1999

Project Name: BRC Former Boeing C-6 Facility, Los Angeles, California

Chemical: Trichloroethlyene (TCE)

Variable Descriptions				Units
CALCULATION OF SOIL GAS CONCENTRATION				
A. SOURCE - Free Product/Soil>100mg/kg.				
Mole fraction	MF	=	0.00E+00	dimensionless
Molecular weight	MW	=	1.30E+05	mg/mole
Vapor pressure	VP	=	7.61E-02	atm
Universal gas constant	R	=	8.20E-05	atm-m3/mole-K
Temperature	T	=	2.93E+02	K
Calculated soil gas concentration	**C_{sg}(fp)**	=	**0.00E+00**	**mg/m3**
B. SOURCE - Groundwater				
Water contamination level	C_w	=	1.10E+03	ug/l
Henry's Law Constant	H	=	4.20E-01	dimensionless
Calculated soil gas concentration	**C_{sg}(gw)**	=	**4.62E+02**	**mg/m3**
C. SOURCE - Soil < 100 mg/kg				
Soil contamination level	C_t	=		mg/kg
Henry's Law Constant	H	=	4.20E-01	dimensionless
Bulk density (dry)	ρ_b	=	1.50E+00	gm/cc
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Water-filled porosity	θ_w	=	1.50E-01	dimensionless
Weight fraction of organic carbon	f_{oc}	=	4.00E-03	dimensionless
Organic carbon partition coefficient	K_{oc}	=	9.40E+01	cm3/gm
Soil/water distribution coef.	K_d	=	**3.76E-01**	cm3/gm
Calculated soil gas concentration	**C_{sg}(s)**	=	**0.00E+00**	**mg/m3**
D. SOURCE - Measured Soil Gas				
Measured soil gas concentration	**C_{sg}(m)**	=		**mg/m3 (ug/l)**

E. SOIL GAS CONCENTRATION USED IN RISK CALCULATIONS >>>> 4.62E+02 mg/m3

DIFFUSIVE TRANSPORT UPWARD IN UNSATURATED ZONE				
Total porosity	θ	=	4.34E-01	dimensionless
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Diffusion coefficient in air	D_a	=	7.90E-02	cm2/sec
Effective diffusion coefficient	**D_e**	=	**6.34E-03**	cm2/sec
Depth of contamination or Csg	X	=	1.98E+01	m
Calculated Flux	**F_x**	=	**5.32E-02**	**mg/m2-hour**

CALCULATING VAPOR CONCENTRATION IN BUILDING

A. INDOOR AIR COMPONENT

Floor area of building	A	=	9.68E+02	m2
% of floor area that flux occurs			1.00E+00	dimensionless
Attenuation factor(Crack factor)	S_b	=	1.00E-02	dimensionless
Flux area within building	Af	=	**9.68E+00**	m2
Interior Height of building	R_h	=	2.44E+00	m
Volume of building	V	=	**2.36E+03**	m3
Exchange rate of air	E	=	8.30E-01	exchanges/hr
Ventilation rate	Q	=	**1.96E+03**	m3/hr
Indoor air component	**C_i**	=	**2.63E-04**	**mg/m3**

B. OUTDOOR AIR COMPONENT

Downwind contamination length	L	=		m
Wind speed	u	=		m/hr
Height of building openings (or height of breathing zone)	h	=		m
Outdoor air component	**C_o**	=	**0.00E+00**	**mg/m3**
C. TOTAL INDOOR AIR CONCENTRATION	**C_t**	=	**2.63E-04**	**mg/m3**

EXPOSURE SCENARIO

Body weight	BW	=	7.00E+01	kg
Inhalation rate	IR	=	2.00E+01	m3/day
Exposure duration	ED	=	2.50E+01	yrs
Hours per day	conversion		8.00E+00	hr/day
Exposure time	ET	=	**3.33E-01**	hr/24 hours
Days per week	conversion		2.50E+00	days/week
Weeks per year	conversion		5.00E+01	weeks/yr
Exposure frequency	EF	=	**1.25E+02**	days/yr
Averaging Time (carc. risk)	AT	=	2.56E+04	days
Averaging Time (non-carc. risk)	AT	=	**9.13E+03**	days
Chemical Intake (carc. risk)	**IT_c**	=	**3.06E-06**	**mg/kg-day**
Chemical Intake (non-carc. risk)	**IT_{nc}**	=	**8.57E-06**	**mg/kg-day**

NON-CARCINOGENIC RISK (Chronic Risk)

Chemical Intake (non-carc. risk)	**IT_{nc}**	=	8.57E-06	mg/kg-day
Reference dose	RfD	=	1.71E-01	mg/kg-day
Hazard Index	**HI**	=	**5.00E-05**	

CARCINOGENIC RISK

Chemical Intake (carc. risk)	IT_c	=	3.06E-06	mg/kg-day
Slope factor (potency)	SF	=	1.00E-02	1/(mg/kg-day)
Cancer Risk	**Risk**	=	**3.06E-08**	

Risk Calculations Version: November 1999

Project Name: BRC Former Boeing C-6 Facility, Los Angeles, California

Chemical: Trichlorofluoromethane (Freon 11)

Variable Descriptions				Units
CALCULATION OF SOIL GAS CONCENTRATION				
A. SOURCE - Free Product/Soil>100mg/kg.				
Mole fraction	MF	=	0.00E+00	dimensionless
Molecular weight	MW	=	1.40E+05	mg/mole
Vapor pressure	VP	=	1.05E+00	atm
Universal gas constant	R	=	8.20E-05	atm-m3/mole-K
Temperature	T	=	2.93E+02	K
Calculated soil gas concentration	**C_{sg}(fp)**	=	**0.00E+00**	**mg/m3**
B. SOURCE - Groundwater				
Water contamination level	C_w	=	5.20E-01	ug/l
Henry's Law Constant	H	=	4.00E+00	dimensionless
Calculated soil gas concentration	**C_{sg}(gw)**	=	**2.08E+00**	**mg/m3**
C. SOURCE - Soil < 100 mg/kg				
Soil contamination level	C_t	=		mg/kg
Henry's Law Constant	H	=	4.00E+00	dimensionless
Bulk density (dry)	ρ_b	=	1.50E+00	gm/cc
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Water-filled porosity	θ_w	=	1.50E-01	dimensionless
Weight fraction of organic carbon	f_{oc}	=	4.00E-03	dimensionless
Organic carbon partition coefficient	K_{oc}	=	1.60E+02	cm3/gm
Soil/water distribution coef.	K_d	=	**6.40E-01**	cm3/gm
Calculated soil gas concentration	**C_{sg}(s)**	=	**0.00E+00**	**mg/m3**
D. SOURCE - Measured Soil Gas				
Measured soil gas concentration	**C_{sg}(m)**	=		**mg/m3 (ug/l)**

E. SOIL GAS CONCENTRATION USED IN RISK CALCULATIONS >>>> 2.08E+00 mg/m3

DIFFUSIVE TRANSPORT UPWARD IN UNSATURATED ZONE				
Total porosity	θ	=	4.34E-01	dimensionless
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Diffusion coefficient in air	D_a	=	8.70E-02	cm2/sec
Effective diffusion coefficient	**D_e**	=	**6.98E-03**	cm2/sec
Depth of contamination or Csg	X	=	1.98E+01	m
Calculated Flux	**F_x**	=	**2.64E-04**	**mg/m2-hour**

Risk Calculations Version: November 1999

CALCULATING VAPOR CONCENTRATION IN BUILDING

A. INDOOR AIR COMPONENT

Floor area of building	A	=	9.68E+02	m2
% of floor area that flux occurs			1.00E+00	dimensionless
Attenuation factor(Crack factor)	S_b	=	1.00E-02	dimensionless
Flux area within building	Af	=	**9.68E+00**	m2
Interior Height of building	R_h	=	2.44E+00	m
Volume of building	V	=	**2.36E+03**	m3
Exchange rate of air	E	=	8.30E-01	exchanges/hr
Ventilation rate	Q	=	**1.96E+03**	m3/hr
Indoor air component	**C_i**	=	**1.30E-06**	**mg/m3**

B. OUTDOOR AIR COMPONENT

Downwind contamination length	L	=		m
Wind speed	u	=		m/hr
Height of building openings (or height of breathing zone)	h	=		m
Outdoor air component	**C_o**	=	**0.00E+00**	**mg/m3**
C. TOTAL INDOOR AIR CONCENTRATION	**C_t**	=	**1.30E-06**	**mg/m3**

EXPOSURE SCENARIO

Body weight	BW	=	7.00E+01	kg
Inhalation rate	IR	=	2.00E+01	m3/day
Exposure duration	ED	=	2.50E+01	yrs
Hours per day	conversion		8.00E+00	hr/day
Exposure time	ET	=	**3.33E-01**	hr/24 hours
Days per week	conversion		2.50E+00	days/week
Weeks per year	conversion		5.00E+01	weeks/yr
Exposure frequency	EF	=	**1.25E+02**	days/yr
Averaging Time (carc. risk)	AT	=	2.56E+04	days
Averaging Time (non-carc. risk)	AT	=	**9.13E+03**	days
Chemical Intake (carc. risk)	**IT_c**	=	**1.52E-08**	**mg/kg-day**
Chemical Intake (non-carc. risk)	**IT_{nc}**	=	**4.25E-08**	**mg/kg-day**

NON-CARCINOGENIC RISK (Chronic Risk)

Chemical Intake (non-carc. risk)	**IT_{nc}**	=	4.25E-08	mg/kg-day
Reference dose	RfD	=	2.00E-01	mg/kg-day
Hazard Index	**HI**	=	**2.13E-07**	

CARCINOGENIC RISK

Chemical Intake (carc. risk)	IT_c	=	1.52E-08	mg/kg-day
Slope factor (potency)	SF	=	0.00E+00	1/(mg/kg-day)
Cancer Risk	**Risk**	=	**No Slope Factor**	

Risk Calculations Version: November 1999

Project Name: BRC Former Boeing C-6 Facility, Los Angeles, California

Chemical: 1,2,4 - Trimethylbenzene

Variable Descriptions				Units
CALCULATION OF SOIL GAS CONCENTRATION				
A. SOURCE - Free Product/Soil>100mg/kg.				
Mole fraction	MF	=	0.00E+00	dimensionless
Molecular weight	MW	=	1.20E+05	mg/mole
Vapor pressure	VP	=	2.76E-03	atm
Universal gas constant	R	=	8.20E-05	atm-m3/mole-K
Temperature	T	=	2.93E+02	K
Calculated soil gas concentration	**C_{sg}(fp)**	=	**0.00E+00**	**mg/m3**
B. SOURCE - Groundwater				
Water contamination level	C_w	=	2.10E-01	ug/l
Henry's Law Constant	H	=	2.30E-01	dimensionless
Calculated soil gas concentration	**C_{sg}(gw)**	=	**4.83E-02**	**mg/m3**
C. SOURCE - Soil < 100 mg/kg				
Soil contamination level	C_t	=		mg/kg
Henry's Law Constant	H	=	2.30E-01	dimensionless
Bulk density (dry)	ρ_b	=	1.50E+00	gm/cc
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Water-filled porosity	θ_w	=	1.50E-01	dimensionless
Weight fraction of organic carbon	f_{oc}	=	4.00E-03	dimensionless
Organic carbon partition coefficient	K_{oc}	=	3.70E+03	cm3/gm
Soil/water distribution coef.	K_d	=	**1.48E+01**	cm3/gm
Calculated soil gas concentration	**C_{sg}(s)**	=	**0.00E+00**	**mg/m3**
D. SOURCE - Measured Soil Gas				
Measured soil gas concentration	**C_{sg}(m)**	=		**mg/m3 (ug/l)**

E. SOIL GAS CONCENTRATION USED IN RISK CALCULATIONS >>>> 4.83E-02 mg/m3

DIFFUSIVE TRANSPORT UPWARD IN UNSATURATED ZONE				
Total porosity	θ	=	4.34E-01	dimensionless
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Diffusion coefficient in air	D_a	=	7.50E-02	cm2/sec
Effective diffusion coefficient	**D_e**	=	**6.02E-03**	cm2/sec
Depth of contamination or Csg	X	=	1.98E+01	m
Calculated Flux	**F_x**	=	**5.28E-06**	**mg/m2-hour**

Risk Calculations Version: November 1999

CALCULATING VAPOR CONCENTRATION IN BUILDING

A. INDOOR AIR COMPONENT

Floor area of building	A	=	9.68E+02	m2
% of floor area that flux occurs			1.00E+00	dimensionless
Attenuation factor(Crack factor)	S_b	=	1.00E-02	dimensionless
Flux area within building	Af	=	**9.68E+00**	m2
Interior Height of building	R_h	=	2.44E+00	m
Volume of building	V	=	**2.36E+03**	m3
Exchange rate of air	E	=	8.30E-01	exchanges/hr
Ventilation rate	Q	=	**1.96E+03**	m3/hr
Indoor air component	**C_i**	=	**2.61E-08**	**mg/m3**

B. OUTDOOR AIR COMPONENT

Downwind contamination length	L	=		m
Wind speed	u	=		m/hr
Height of building openings (or height of breathing zone)	h	=		m
Outdoor air component	**C_o**	=	**0.00E+00**	**mg/m3**
C. TOTAL INDOOR AIR CONCENTRATION	**C_t**	=	**2.61E-08**	**mg/m3**

EXPOSURE SCENARIO

Body weight	BW	=	7.00E+01	kg
Inhalation rate	IR	=	2.00E+01	m3/day
Exposure duration	ED	=	2.50E+01	yrs
Hours per day	conversion		8.00E+00	hr/day
Exposure time	ET	=	**3.33E-01**	hr/24 hours
Days per week	conversion		2.50E+00	days/week
Weeks per year	conversion		5.00E+01	weeks/yr
Exposure frequency	EF	=	**1.25E+02**	days/yr
Averaging Time (carc. risk)	AT	=	2.56E+04	days
Averaging Time (non-carc. risk)	AT	=	**9.13E+03**	days
Chemical Intake (carc. risk)	**IT_c**	=	**3.03E-10**	**mg/kg-day**
Chemical Intake (non-carc. risk)	**IT_{nc}**	=	**8.51E-10**	**mg/kg-day**

NON-CARCINOGENIC RISK (Chronic Risk)

Chemical Intake (non-carc. risk)	**IT_{nc}**	=	8.51E-10	mg/kg-day
Reference dose	RfD	=	1.70E-03	mg/kg-day
Hazard Index	**HI**	=	**5.01E-07**	

CARCINOGENIC RISK

Chemical Intake (carc. risk)	IT_c	=	3.03E-10	mg/kg-day
Slope factor (potency)	SF	=	0.00E+00	1/(mg/kg-day)
Cancer Risk	**Risk**	=	**No Slope Factor**	

Risk Calculations Version: November 1999

Project Name: BRC Former Boeing C-6 Facility, Los Angeles, California

Chemical: 1,3,5 - Trimethylbenzene

Variable Descriptions				Units
CALCULATION OF SOIL GAS CONCENTRATION				
A. SOURCE - Free Product/Soil>100mg/kg.				
Mole fraction	MF	=	0.00E+00	dimensionless
Molecular weight	MW	=	1.20E+05	mg/mole
Vapor pressure	VP	=	3.26E-03	atm
Universal gas constant	R	=	8.20E-05	atm-m3/mole-K
Temperature	T	=	2.93E+02	K
Calculated soil gas concentration	**C_{sg}(fp)**	=	**0.00E+00**	**mg/m3**
B. SOURCE - Groundwater				
Water contamination level	C_w	=	5.10E-01	ug/l
Henry's Law Constant	H	=	3.20E-01	dimensionless
Calculated soil gas concentration	**C_{sg}(gw)**	=	**1.63E-01**	**mg/m3**
C. SOURCE - Soil < 100 mg/kg				
Soil contamination level	C_t	=		mg/kg
Henry's Law Constant	H	=	3.20E-01	dimensionless
Bulk density (dry)	ρ_b	=	1.50E+00	gm/cc
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Water-filled porosity	θ_w	=	1.50E-01	dimensionless
Weight fraction of organic carbon	f_{oc}	=	4.00E-03	dimensionless
Organic carbon partition coefficient	K_{oc}	=	8.20E+02	cm3/gm
Soil/water distribution coef.	K_d	=	**3.28E+00**	cm3/gm
Calculated soil gas concentration	**C_{sg}(s)**	=	**0.00E+00**	**mg/m3**
D. SOURCE - Measured Soil Gas				
Measured soil gas concentration	**C_{sg}(m)**	=		**mg/m3 (ug/l)**

E. SOIL GAS CONCENTRATION USED IN RISK CALCULATIONS >>>> 1.63E-01 mg/m3

DIFFUSIVE TRANSPORT UPWARD IN UNSATURATED ZONE				
Total porosity	θ	=	4.34E-01	dimensionless
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Diffusion coefficient in air	D_a	=	7.50E-02	cm2/sec
Effective diffusion coefficient	**D_e**	=	**6.02E-03**	cm2/sec
Depth of contamination or Csg	X	=	1.98E+01	m
Calculated Flux	**F_x**	=	**1.79E-05**	**mg/m2-hour**

CALCULATING VAPOR CONCENTRATION IN BUILDING

A. INDOOR AIR COMPONENT

Floor area of building	A	=	9.68E+02	m2
% of floor area that flux occurs			1.00E+00	dimensionless
Attenuation factor(Crack factor)	S_b	=	1.00E-02	dimensionless
Flux area within building	Af	=	**9.68E+00**	m2
Interior Height of building	R_h	=	2.44E+00	m
Volume of building	V	=	**2.36E+03**	m3
Exchange rate of air	E	=	8.30E-01	exchanges/hr
Ventilation rate	Q	=	**1.96E+03**	m3/hr
Indoor air component	**C_i**	=	**8.82E-08**	**mg/m3**

B. OUTDOOR AIR COMPONENT

Downwind contamination length	L	=		m
Wind speed	u	=		m/hr
Height of building openings (or height of breathing zone)	h	=		m
Outdoor air component	**C_o**	=	**0.00E+00**	**mg/m3**
C. TOTAL INDOOR AIR CONCENTRATION	**C_t**	=	**8.82E-08**	**mg/m3**

EXPOSURE SCENARIO

Body weight	BW	=	7.00E+01	kg
Inhalation rate	IR	=	2.00E+01	m3/day
Exposure duration	ED	=	2.50E+01	yrs
Hours per day	conversion		8.00E+00	hr/day
Exposure time	ET	=	**3.33E-01**	hr/24 hours
Days per week	conversion		2.50E+00	days/week
Weeks per year	conversion		5.00E+01	weeks/yr
Exposure frequency	EF	=	**1.25E+02**	days/yr
Averaging Time (carc. risk)	AT	=	2.56E+04	days
Averaging Time (non-carc. risk)	AT	=	**9.13E+03**	days
Chemical Intake (carc. risk)	**IT_c**	=	**1.02E-09**	**mg/kg-day**
Chemical Intake (non-carc. risk)	**IT_{nc}**	=	**2.88E-09**	**mg/kg-day**

NON-CARCINOGENIC RISK (Chronic Risk)

Chemical Intake (non-carc. risk)	**IT_{nc}**	=	2.88E-09	mg/kg-day
Reference dose	RfD	=	1.70E-03	mg/kg-day
Hazard Index	**HI**	=	**1.69E-06**	

CARCINOGENIC RISK

Chemical Intake (carc. risk)	IT_c	=	1.02E-09	mg/kg-day
Slope factor (potency)	SF	=	0.00E+00	1/(mg/kg-day)
Cancer Risk	**Risk**	=	**No Slope Factor**	

CHEMICAL PARAMETERS

CAS No.		MW (mg/mole)		H' (dimensionless)		Da (cm^2/sec)		VP (atm)	Temp. (°C)		K_{oc} (cm^3/g)		Water Solubility (mg/L-water)		CSF (inh) (mg/kg-day)$^{-1}$		Chronic RfD (inh) (mg/kg-day)	
127-18-4	Tetrachloroethylene (PCE)	1.7E+05	a	7.5E-01	a	7.2E-02	a	2.4E-02	25	b	2.7E+02	a	2.0E+02	a	2.1E-02	c	1.0E-02	e
75-09-2	Methylene Chloride	8.5E+04	a	9.0E-02	a	1.0E-01	a	5.7E-01	25	b	1.0E+01	a	1.3E+04	a	3.5E-03	c	1.1E-01	e
67-66-3	Chloroform	1.2E+05	a	1.5E-01	a	1.0E-01	a	2.6E-01	25	b	5.3E+01	a	7.9E+03	a	1.9E-02	c	8.6E-02	e
95-63-6	1,2,4 - Trimethylbenzene	1.2E+05	a	2.3E-01	a	7.5E-02	a	2.8E-03	25	b	3.7E+03	a	2.6E-01	a	0.00E+00		1.70E-03	
78-93-3	Methyl Ethyl Ketone	7.2E+04	a	1.1E-03	a	9.0E-02	a	1.2E-01	25	b	4.5E+00	a	2.7E+05	a	0.00E+00		1.43E-01	
71-43-2	Benzene	7.8E+04	a	2.3E-01	a	8.8E-02	a	1.2E-01	25	b	6.2E+01	a	1.8E+03	a	1.00E-01		1.71E-02	
75-15-0	Carbon disulfide	7.6E+04	a	1.2E+00	a	1.0E-01	a	4.7E-01	25	b	4.6E+01	a	1.2E+03	a	0.00E+00		2.00E-01	
56-23-5	Carbon tetrachloride	1.5E+05	a	1.2E+00	a	7.8E-02	a	1.5E-01	25	b	1.5E+02	a	7.9E+02	a	1.50E-01		1.14E-02	
156-59-2	cis-1,2-Dichloroethylene (cis 1,2-DCE)	9.7E+04	a	1.7E-01	a	7.4E-02	a	2.4E-04	20	b	3.6E+01	a	3.5E+03	a	0.00E+00		1.00E-02	
100-41-4	Ethylbenzene	1.1E+05	a	3.2E-01	a	7.5E-02	a	1.3E-02	25	b	2.0E+02	a	1.7E+02	a	0.00E+00		5.71E-01	
98-82-8	Isopropyl-benzene (cumene, 1-methyethyl benzene)	1.2E+05	a	4.9E+01	a	7.5E-02	a	5.9E-03	25	b	2.2E+02	a	6.1E+01	a	0.00E+00		1.10E-01	
75-01-4	Vinyl chloride	6.3E+04	a	1.1E+00	a	1.1E-01	a	########	25	b	1.9E+01	a	2.8E+03	a	2.70E-01		7.43E-03	
1330-20-7	Xylenes	1.1E+05	a	3.0E-01	a	7.0E-02	a	1.1E-02	25	b	2.0E+02	a	1.6E+02	a	0.00E+00		2.00E-01	
104-51-8	n-butylbenzene	1.3E+05	a	5.4E-01	a	7.5E-02	a	1.3E-03	23	d	2.8E+03	a	1.4E+01	a	0.00E+00		1.00E-02	
135-98-8	sec-butylbenzene	1.3E+05	a	7.7E-01	a	7.5E-02	a	1.4E-03	20	d	2.2E+03	a	1.7E+01	a	0.00E+00		1.00E-02	
103-65-1	n-propylbenzene	1.2E+05	b	5.4E-01	a	7.5E-02	a	1.3E-03	6.3	b	2.8E+03	a	1.4E+01	a	0.00E+00		1.00E-02	
108-88-3	Toluene	9.2E+04	a	2.7E-01	a	8.7E-02	a	3.7E-02	25	b	1.4E+02	a	5.3E+02	a	0.00E+00		8.57E-02	
156-60-5	trans-1,2-Dichloroethylene (trans-1,2-DCE)	9.7E+04	a	3.8E-01	a	7.1E-02	a	5.2E-01	30	b	3.8E+01	a	6.3E+03	a	0.00E+00		2.00E-02	
79-01-6	Trichloroethlyene (TCE)	1.3E+05	a	4.2E-01	a	7.9E-02	a	7.6E-02	20	b	9.4E+01	a	1.1E+03	a	1.00E-02		1.71E-01	
75-69-4	Trichlorofluoromethane (Freon 11)	1.4E+05	a	4.0E+00	a	8.7E-02	a	########	25	b	1.6E+02	a	1.1E+03	a	0.00E+00		2.00E-01	
108-10-1	4-Methyl-2-pentanone (MIBK)	1.0E+05	a	5.7E-03	a	7.5E-02	a	2.6E-02	25	b	1.3E+02	a	1.9E+04	a	0.00E+00		2.29E-02	
108-67-8	1,3,5 - Trimethylbenzene	1.2E+05	a	3.2E-01	a	7.5E-02	a	3.3E-03	25	b	8.2E+02	a	5.0E+01	a	0.00E+00		1.70E-03	
75-34-3	1,1 - Dichloroethane (1,1-DCA)	9.9E+04	a	2.3E-01	a	7.4E-02	a	3.1E-01	25	b	5.3E+01	a	5.1E+03	a	5.70E-03		1.40E-01	
107-06-2	1,2-Dichloroethane (EDC)	9.9E+04	a	4.0E-02	a	1.0E-01	a	1.1E-01	25	b	3.8E+01	a	8.5E+03	a	7.00E-02		1.14E-01	
75-35-4	1,1-Dichloroethylene (1,1-DCE)	9.7E+04	a	1.1E+00	a	9.0E-02	a	7.8E-01	25	b	6.5E+01	a	2.3E+03	a	1.75E-01		2.00E-02	
71-55-6	1,1,1-Trichloroethane (1,1,1-TCA)	1.3E+05	a	7.1E-01	a	7.8E-02	a	1.6E-01	25	b	1.4E+02	a	1.3E+03	a	0.00E+00		2.86E-01	
79-00-5	1,1,2 - TCA	1.3E+05	a	3.7E-02	a	7.8E-02	a	3.1E-02	25	b	7.5E+01	a	4.4E+03	a	5.70E-02		4.00E-03	

References:

a EPA Region 9, Preliminary Remediation Goals (PRGs), 2000.

b U.S. National Library of Medicine Hazardous Substance Data Bank (HSDB), http://www.nlm.nih.gov/pubs/factsheets/hsdbfs.html

c Cal-EPA Office of Environmental Health Hazard Assessment (OEHHA), Toxicity Criteria Database and December 2000 California Cancer Potency Values, http://www.oehha.ca.gov/risk/chemicalDB/index.asp

d Risk Assessment Information System (RAIS) Toxicity & Chemical-Specific Factors Data Base, January 2001, http://risk.lsd.ornl.gov/cgi-bin/tox/TOX_select?select=csf

e Cal-EPA, Air Resources Board (ARB), Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values, October 10, 2000, http://www.arb.ca.gov/ab2588/riskassess.htm

Toxicity Value reference priority:

1. Cal-EPA Office of Environmental Health Hazard Assessment (OEHHA), Toxicity Criteria Database and December 2000 California Cancer Potency Values, http://www.oehha.ca.gov/risk/chemicalDB/index.asp
2. Cal-EPA, Air Resources Board (ARB), Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values, October 10, 2000, http://www.arb.ca.gov/ab2588/riskassess.htm
3. EPA Region 9, Preliminary Remediation Goals (PRGs), 2000.

SUMMARY OF VAPOR MIGRATION RESULTS - COMMERCIAL/LIGHT INDUSTRIAL SCENARIO
BRC Former C-6 Facility, Los Angeles, California

Groundwater

CAS No.	Chemical	Estimated Concentration in Groundwater (ug/L)	Cancer Risk	Hazard Index
75-34-3	1,1-Dichloroethane (1,1-DCA)	13	1.1E-10	0.00000037
107-06-2	1,2-Dichloroethane (1,2-DCA)	2.3	5.4E-11	0.000000019
75-34-3	1,1-Dichloroethylene (1,1-DCE)	120	1.7E-07	0.00014
156-59-2	cis-1,2-Dichloroethylene (cis 1,2-DCE)	10	No Slope Factor	0.0000030
127-18-4	Tetrachloroethene (PCE)	25	2.4E-09	0.000032
71-55-6	1,1,1-Trichloroethane	2.2	No Slope Factor	0.00000010
79-00-5	1,1,2-Trichloroethane	4.3	5.9E-11	0.00000073
79-01-6	Trichloroethlyene (TCE)	60	1.7E-09	0.0000027
	Total		1.8E-07	0.00018

Risk Calculations Version: November 1999

Project Name: BRC Former Boeing C-6 Facility, Los Angeles, California

Chemical: 1,1 - Dichloroethane (1,1-DCA)

Variable Descriptions				Units
CALCULATION OF SOIL GAS CONCENTRATION				
A. SOURCE - Free Product/Soil>100mg/kg.				
Mole fraction	MF	=	0.00E+00	dimensionless
Molecular weight	MW	=	9.90E+04	mg/mole
Vapor pressure	VP	=	3.08E-01	atm
Universal gas constant	R	=	8.20E-05	atm-m3/mole-K
Temperature	T	=	2.93E+02	K
Calculated soil gas concentration	**C_{sg}(fp)**	=	**0.00E+00**	**mg/m3**
B. SOURCE - Groundwater				
Water contamination level	C_w	=	1.30E+01	ug/l
Henry's Law Constant	H	=	2.30E-01	dimensionless
Calculated soil gas concentration	**C_{sg}(gw)**	=	**2.99E+00**	**mg/m3**
C. SOURCE - Soil < 100 mg/kg				
Soil contamination level	C_t	=		mg/kg
Henry's Law Constant	H	=	2.30E-01	dimensionless
Bulk density (dry)	ρ_b	=	1.50E+00	gm/cc
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Water-filled porosity	θ_w	=	1.50E-01	dimensionless
Weight fraction of organic carbon	f_{oc}	=	4.00E-03	dimensionless
Organic carbon partition coefficient	K_{oc}	=	5.30E+01	cm3/gm
Soil/water distribution coef.	K_d	=	**2.12E-01**	cm3/gm
Calculated soil gas concentration	**C_{sg}(s)**	=	**0.00E+00**	**mg/m3**
D. SOURCE - Measured Soil Gas				
Measured soil gas concentration	**C_{sg}(m)**	=		**mg/m3 (ug/l)**

E. SOIL GAS CONCENTRATION USED IN RISK CALCULATIONS >>>> 2.99E+00 mg/m3

DIFFUSIVE TRANSPORT UPWARD IN UNSATURATED ZONE				
Total porosity	θ	=	4.34E-01	dimensionless
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Diffusion coefficient in air	D_a	=	7.40E-02	cm2/sec
Effective diffusion coefficient	**D_e**	=	**5.94E-03**	cm2/sec
Depth of contamination or Csg	X	=	1.98E+01	m
Calculated Flux	**F_x**	=	**3.23E-04**	**mg/m2-hour**

Risk Calculations Version: November 1999

CALCULATING VAPOR CONCENTRATION IN BUILDING

A. INDOOR AIR COMPONENT

Floor area of building	A	=	9.68E+02	m2
% of floor area that flux occurs			1.00E+00	dimensionless
Attenuation factor(Crack factor)	S_b	=	1.00E-02	dimensionless
Flux area within building	Af	=	**9.68E+00**	m2
Interior Height of building	R_h	=	2.44E+00	m
Volume of building	V	=	**2.36E+03**	m3
Exchange rate of air	E	=	8.30E-01	exchanges/hr
Ventilation rate	Q	=	**1.96E+03**	m3/hr
Indoor air component	**C_i**	=	**1.59E-06**	**mg/m3**

B. OUTDOOR AIR COMPONENT

Downwind contamination length	L	=		m
Wind speed	u	=		m/hr
Height of building openings (or height of breathing zone)	h	=		m
Outdoor air component	**C_o**	=	**0.00E+00**	**mg/m3**
C. TOTAL INDOOR AIR CONCENTRATION	**C_t**	=	**1.59E-06**	**mg/m3**

EXPOSURE SCENARIO

Body weight	BW	=	7.00E+01	kg
Inhalation rate	IR	=	2.00E+01	m3/day
Exposure duration	ED	=	2.50E+01	yrs
Hours per day	conversion		8.00E+00	hr/day
Exposure time	ET	=	**3.33E-01**	hr/24 hours
Days per week	conversion		2.50E+00	days/week
Weeks per year	conversion		5.00E+01	weeks/yr
Exposure frequency	EF	=	**1.25E+02**	days/yr
Averaging Time (carc. risk)	AT	=	2.56E+04	days
Averaging Time (non-carc. risk)	AT	=	**9.13E+03**	days
Chemical Intake (carc. risk)	**IT_c**	=	**1.85E-08**	**mg/kg-day**
Chemical Intake (non-carc. risk)	**IT_{nc}**	=	**5.20E-08**	**mg/kg-day**

NON-CARCINOGENIC RISK (Chronic Risk)

Chemical Intake (non-carc. risk)	**IT_{nc}**	=	5.20E-08	mg/kg-day
Reference dose	RfD	=	1.40E-01	mg/kg-day
Hazard Index	**HI**	=	**3.71E-07**	

CARCINOGENIC RISK

Chemical Intake (carc. risk)	IT_c	=	1.85E-08	mg/kg-day
Slope factor (potency)	SF	=	5.70E-03	1/(mg/kg-day)
Cancer Risk	**Risk**	=	**1.06E-10**	

Risk Calculations Version: November 1999

Project Name: BRC Former Boeing C-6 Facility, Los Angeles, California

Chemical: 1,2-Dichloroethane (EDC)

Variable Descriptions				Units
CALCULATION OF SOIL GAS CONCENTRATION				
A. SOURCE - Free Product/Soil>100mg/kg.				
Mole fraction	MF	=	0.00E+00	dimensionless
Molecular weight	MW	=	9.90E+04	mg/mole
Vapor pressure	VP	=	1.14E-01	atm
Universal gas constant	R	=	8.20E-05	atm-m3/mole-K
Temperature	T	=	2.93E+02	K
Calculated soil gas concentration	**C_{sg}(fp)**	=	**0.00E+00**	**mg/m3**
B. SOURCE - Groundwater				
Water contamination level	C_w	=	2.30E+00	ug/l
Henry's Law Constant	H	=	4.00E-02	dimensionless
Calculated soil gas concentration	**C_{sg}(gw)**	=	**9.20E-02**	**mg/m3**
C. SOURCE - Soil < 100 mg/kg				
Soil contamination level	C_t	=		mg/kg
Henry's Law Constant	H	=	4.00E-02	dimensionless
Bulk density (dry)	ρ_b	=	1.50E+00	gm/cc
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Water-filled porosity	θ_w	=	1.50E-01	dimensionless
Weight fraction of organic carbon	f_{oc}	=	4.00E-03	dimensionless
Organic carbon partition coefficient	K_{oc}	=	3.80E+01	cm3/gm
Soil/water distribution coef.	K_d	=	**1.52E-01**	cm3/gm
Calculated soil gas concentration	**C_{sg}(s)**	=	**0.00E+00**	**mg/m3**
D. SOURCE - Measured Soil Gas				
Measured soil gas concentration	**C_{sg}(m)**	=		**mg/m3 (ug/l)**

E. SOIL GAS CONCENTRATION USED IN RISK CALCULATIONS >>>> 9.20E-02 mg/m3

DIFFUSIVE TRANSPORT UPWARD IN UNSATURATED ZONE				
Total porosity	θ	=	4.34E-01	dimensionless
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Diffusion coefficient in air	D_a	=	1.00E-01	cm2/sec
Effective diffusion coefficient	**D_e**	=	**8.03E-03**	cm2/sec
Depth of contamination or Csg	X	=	1.98E+01	m
Calculated Flux	**F_x**	=	**1.34E-05**	**mg/m2-hour**

CALCULATING VAPOR CONCENTRATION IN BUILDING

A. INDOOR AIR COMPONENT

Floor area of building	A	=	9.68E+02	m2
% of floor area that flux occurs			1.00E+00	dimensionless
Attenuation factor(Crack factor)	S_b	=	1.00E-02	dimensionless
Flux area within building	Af	=	**9.68E+00**	m2
Interior Height of building	R_h	=	2.44E+00	m
Volume of building	V	=	**2.36E+03**	m3
Exchange rate of air	E	=	8.30E-01	exchanges/hr
Ventilation rate	Q	=	**1.96E+03**	m3/hr
Indoor air component	**C_i**	=	**6.63E-08**	**mg/m3**

B. OUTDOOR AIR COMPONENT

Downwind contamination length	L	=		m
Wind speed	u	=		m/hr
Height of building openings (or height of breathing zone)	h	=		m
Outdoor air component	**C_o**	=	**0.00E+00**	**mg/m3**
C. TOTAL INDOOR AIR CONCENTRATION	**C_t**	=	**6.63E-08**	**mg/m3**

EXPOSURE SCENARIO

Body weight	BW	=	7.00E+01	kg
Inhalation rate	IR	=	2.00E+01	m3/day
Exposure duration	ED	=	2.50E+01	yrs
Hours per day	conversion		8.00E+00	hr/day
Exposure time	ET	=	**3.33E-01**	hr/24 hours
Days per week	conversion		2.50E+00	days/week
Weeks per year	conversion		5.00E+01	weeks/yr
Exposure frequency	EF	=	**1.25E+02**	days/yr
Averaging Time (carc. risk)	AT	=	2.56E+04	days
Averaging Time (non-carc. risk)	AT	=	**9.13E+03**	days
Chemical Intake (carc. risk)	**IT_c**	=	**7.70E-10**	**mg/kg-day**
Chemical Intake (non-carc. risk)	**IT_{nc}**	=	**2.16E-09**	**mg/kg-day**

NON-CARCINOGENIC RISK (Chronic Risk)

Chemical Intake (non-carc. risk)	**IT_{nc}**	=	2.16E-09	mg/kg-day
Reference dose	RfD	=	1.14E-01	mg/kg-day
Hazard Index	**HI**	=	**1.89E-08**	

CARCINOGENIC RISK

Chemical Intake (carc. risk)	IT_c	=	7.70E-10	mg/kg-day
Slope factor (potency)	SF	=	7.00E-02	1/(mg/kg-day)
Cancer Risk	**Risk**	=	**5.39E-11**	

Risk Calculations Version: November 1999

Project Name: BRC Former Boeing C-6 Facility, Los Angeles, California

Chemical: 1,1-Dichloroethylene (1,1-DCE)

Variable Descriptions				Units
CALCULATION OF SOIL GAS CONCENTRATION				
A. SOURCE - Free Product/Soil>100mg/kg.				
Mole fraction	MF	=	0.00E+00	dimensionless
Molecular weight	MW	=	9.70E+04	mg/mole
Vapor pressure	VP	=	7.78E-01	atm
Universal gas constant	R	=	8.20E-05	atm-m3/mole-K
Temperature	T	=	2.93E+02	K
Calculated soil gas concentration	**C_{sg}(fp)**	=	**0.00E+00**	**mg/m3**
B. SOURCE - Groundwater				
Water contamination level	C_w	=	1.20E+02	ug/l
Henry's Law Constant	H	=	1.10E+00	dimensionless
Calculated soil gas concentration	**C_{sg}(gw)**	=	**1.32E+02**	**mg/m3**
C. SOURCE - Soil < 100 mg/kg				
Soil contamination level	C_t	=		mg/kg
Henry's Law Constant	H	=	1.10E+00	dimensionless
Bulk density (dry)	ρ_b	=	1.50E+00	gm/cc
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Water-filled porosity	θ_w	=	1.50E-01	dimensionless
Weight fraction of organic carbon	f_{oc}	=	4.00E-03	dimensionless
Organic carbon partition coefficient	K_{oc}	=	6.50E+01	cm3/gm
Soil/water distribution coef.	K_d	=	**2.60E-01**	cm3/gm
Calculated soil gas concentration	**C_{sg}(s)**	=	**0.00E+00**	**mg/m3**
D. SOURCE - Measured Soil Gas				
Measured soil gas concentration	**C_{sg}(m)**	=		**mg/m3 (ug/l)**

E. SOIL GAS CONCENTRATION USED IN RISK CALCULATIONS >>>> 1.32E+02 mg/m3

DIFFUSIVE TRANSPORT UPWARD IN UNSATURATED ZONE				
Total porosity	θ	=	4.34E-01	dimensionless
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Diffusion coefficient in air	D_a	=	9.00E-02	cm2/sec
Effective diffusion coefficient	**D_e**	=	**7.22E-03**	cm2/sec
Depth of contamination or Csg	X	=	1.98E+01	m
Calculated Flux	**F_x**	=	**1.73E-02**	**mg/m2-hour**

CALCULATING VAPOR CONCENTRATION IN BUILDING

A. INDOOR AIR COMPONENT

Floor area of building	A	=	9.68E+02	m2
% of floor area that flux occurs			1.00E+00	dimensionless
Attenuation factor(Crack factor)	S_b	=	1.00E-02	dimensionless
Flux area within building	Af	=	**9.68E+00**	m2
Interior Height of building	R_h	=	2.44E+00	m
Volume of building	V	=	**2.36E+03**	m3
Exchange rate of air	E	=	8.30E-01	exchanges/hr
Ventilation rate	Q	=	**1.96E+03**	m3/hr
Indoor air component	**C_i**	=	**8.56E-05**	**mg/m3**

B. OUTDOOR AIR COMPONENT

Downwind contamination length	L	=		m
Wind speed	u	=		m/hr
Height of building openings (or height of breathing zone)	h	=		m
Outdoor air component	**C_o**	=	**0.00E+00**	**mg/m3**
C. TOTAL INDOOR AIR CONCENTRATION	**C_t**	=	**8.56E-05**	**mg/m3**

EXPOSURE SCENARIO

Body weight	BW	=	7.00E+01	kg
Inhalation rate	IR	=	2.00E+01	m3/day
Exposure duration	ED	=	2.50E+01	yrs
Hours per day	conversion		8.00E+00	hr/day
Exposure time	ET	=	**3.33E-01**	hr/24 hours
Days per week	conversion		2.50E+00	days/week
Weeks per year	conversion		5.00E+01	weeks/yr
Exposure frequency	EF	=	**1.25E+02**	days/yr
Averaging Time (carc. risk)	AT	=	2.56E+04	days
Averaging Time (non-carc. risk)	AT	=	**9.13E+03**	days
Chemical Intake (carc. risk)	**IT_c**	=	**9.95E-07**	**mg/kg-day**
Chemical Intake (non-carc. risk)	**IT_{nc}**	=	**2.79E-06**	**mg/kg-day**

NON-CARCINOGENIC RISK (Chronic Risk)

Chemical Intake (non-carc. risk)	**IT_{nc}**	=	2.79E-06	mg/kg-day
Reference dose	RfD	=	2.00E-02	mg/kg-day
Hazard Index	**HI**	=	**1.40E-04**	

CARCINOGENIC RISK

Chemical Intake (carc. risk)	IT_c	=	9.95E-07	mg/kg-day
Slope factor (potency)	SF	=	1.75E-01	1/(mg/kg-day)
Cancer Risk	**Risk**	=	**1.74E-07**	

Risk Calculations Version: November 1999

Project Name: BRC Former Boeing C-6 Facility, Los Angeles, California

Chemical: cis-1,2-Dichloroethylene (cis 1,2-DCE)

Variable Descriptions				Units
CALCULATION OF SOIL GAS CONCENTRATION				
A. SOURCE - Free Product/Soil>100mg/kg.				
Mole fraction	MF	=	0.00E+00	dimensionless
Molecular weight	MW	=	9.70E+04	mg/mole
Vapor pressure	VP	=	2.40E-04	atm
Universal gas constant	R	=	8.20E-05	atm-m3/mole-K
Temperature	T	=	2.93E+02	K
Calculated soil gas concentration	**C_{sg}(fp)**	=	**0.00E+00**	**mg/m3**
B. SOURCE - Groundwater				
Water contamination level	C_w	=	1.00E+01	ug/l
Henry's Law Constant	H	=	1.70E-01	dimensionless
Calculated soil gas concentration	**C_{sg}(gw)**	=	**1.70E+00**	**mg/m3**
C. SOURCE - Soil < 100 mg/kg				
Soil contamination level	C_t	=		mg/kg
Henry's Law Constant	H	=	1.70E-01	dimensionless
Bulk density (dry)	ρ_b	=	1.50E+00	gm/cc
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Water-filled porosity	θ_w	=	1.50E-01	dimensionless
Weight fraction of organic carbon	f_{oc}	=	4.00E-03	dimensionless
Organic carbon partition coefficient	K_{oc}	=	3.60E+01	cm3/gm
Soil/water distribution coef.	K_d	=	**1.44E-01**	cm3/gm
Calculated soil gas concentration	**C_{sg}(s)**	=	**0.00E+00**	**mg/m3**
D. SOURCE - Measured Soil Gas				
Measured soil gas concentration	**C_{sg}(m)**	=		**mg/m3 (ug/l)**

E. SOIL GAS CONCENTRATION USED IN RISK CALCULATIONS >>>> 1.70E+00 mg/m3

DIFFUSIVE TRANSPORT UPWARD IN UNSATURATED ZONE				
Total porosity	θ	=	4.34E-01	dimensionless
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Diffusion coefficient in air	D_a	=	7.40E-02	cm2/sec
Effective diffusion coefficient	**D_e**	=	**5.94E-03**	cm2/sec
Depth of contamination or Csg	X	=	1.98E+01	m
Calculated Flux	**F_x**	=	**1.83E-04**	**mg/m2-hour**

Risk Calculations Version: November 1999

CALCULATING VAPOR CONCENTRATION IN BUILDING

A. INDOOR AIR COMPONENT

Floor area of building	A	=	9.68E+02	m2
% of floor area that flux occurs			1.00E+00	dimensionless
Attenuation factor(Crack factor)	S_b	=	1.00E-02	dimensionless
Flux area within building	Af	=	**9.68E+00**	m2
Interior Height of building	R_h	=	2.44E+00	m
Volume of building	V	=	**2.36E+03**	m3
Exchange rate of air	E	=	8.30E-01	exchanges/hr
Ventilation rate	Q	=	**1.96E+03**	m3/hr
Indoor air component	**C_i**	=	**9.06E-07**	**mg/m3**

B. OUTDOOR AIR COMPONENT

Downwind contamination length	L	=		m
Wind speed	u	=		m/hr
Height of building openings (or height of breathing zone)	h	=		m
Outdoor air component	**C_o**	=	**0.00E+00**	**mg/m3**
C. TOTAL INDOOR AIR CONCENTRATION	**C_t**	=	**9.06E-07**	**mg/m3**

EXPOSURE SCENARIO

Body weight	BW	=	7.00E+01	kg
Inhalation rate	IR	=	2.00E+01	m3/day
Exposure duration	ED	=	2.50E+01	yrs
Hours per day	conversion		8.00E+00	hr/day
Exposure time	ET	=	**3.33E-01**	hr/24 hours
Days per week	conversion		2.50E+00	days/week
Weeks per year	conversion		5.00E+01	weeks/yr
Exposure frequency	EF	=	**1.25E+02**	days/yr
Averaging Time (carc. risk)	AT	=	2.56E+04	days
Averaging Time (non-carc. risk)	AT	=	**9.13E+03**	days
Chemical Intake (carc. risk)	**IT_c**	=	**1.05E-08**	**mg/kg-day**
Chemical Intake (non-carc. risk)	**IT_{nc}**	=	**2.96E-08**	**mg/kg-day**

NON-CARCINOGENIC RISK (Chronic Risk)

Chemical Intake (non-carc. risk)	**IT_{nc}**	=	2.96E-08	mg/kg-day
Reference dose	RfD	=	1.00E-02	mg/kg-day
Hazard Index	**HI**	=	**2.96E-06**	

CARCINOGENIC RISK

Chemical Intake (carc. risk)	IT_c	=	1.05E-08	mg/kg-day
Slope factor (potency)	SF	=	0.00E+00	1/(mg/kg-day)
Cancer Risk	**Risk**	=	**No Slope Factor**	

Risk Calculations Version: November 1999

Project Name: BRC Former Boeing C-6 Facility, Los Angeles, California

Chemical: Tetrachloroethylene (PCE)

Variable Descriptions				Units
CALCULATION OF SOIL GAS CONCENTRATION				
A. SOURCE - Free Product/Soil>100mg/kg.				
Mole fraction	MF	=	0.00E+00	dimensionless
Molecular weight	MW	=	1.70E+05	mg/mole
Vapor pressure	VP	=	2.43E-02	atm
Universal gas constant	R	=	8.20E-05	atm-m3/mole-K
Temperature	T	=	2.93E+02	K
Calculated soil gas concentration	**C_{sg}(fp)**	=	**0.00E+00**	**mg/m3**
B. SOURCE - Groundwater				
Water contamination level	C_w	=	2.50E+01	ug/l
Henry's Law Constant	H	=	7.50E-01	dimensionless
Calculated soil gas concentration	**C_{sg}(gw)**	=	**1.88E+01**	**mg/m3**
C. SOURCE - Soil < 100 mg/kg				
Soil contamination level	C_t	=		mg/kg
Henry's Law Constant	H	=	7.50E-01	dimensionless
Bulk density (dry)	ρ_b	=	1.50E+00	gm/cc
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Water-filled porosity	θ_w	=	1.50E-01	dimensionless
Weight fraction of organic carbon	f_{oc}	=	4.00E-03	dimensionless
Organic carbon partition coefficient	K_{oc}	=	2.70E+02	cm3/gm
Soil/water distribution coef.	K_d	=	**1.08E+00**	cm3/gm
Calculated soil gas concentration	**C_{sg}(s)**	=	**0.00E+00**	**mg/m3**
D. SOURCE - Measured Soil Gas				
Measured soil gas concentration	**C_{sg}(m)**	=		**mg/m3 (ug/l)**

E. SOIL GAS CONCENTRATION USED IN RISK CALCULATIONS >>>> 1.88E+01 mg/m3

DIFFUSIVE TRANSPORT UPWARD IN UNSATURATED ZONE				
Total porosity	θ	=	4.34E-01	dimensionless
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Diffusion coefficient in air	D_a	=	7.20E-02	cm2/sec
Effective diffusion coefficient	**D_e**	=	**5.78E-03**	cm2/sec
Depth of contamination or Csg	X	=	1.98E+01	m
Calculated Flux	**F_x**	=	**1.97E-03**	**mg/m2-hour**

CALCULATING VAPOR CONCENTRATION IN BUILDING

A. INDOOR AIR COMPONENT

Floor area of building	A	=	9.68E+02	m2
% of floor area that flux occurs			1.00E+00	dimensionless
Attenuation factor(Crack factor)	S_b	=	1.00E-02	dimensionless
Flux area within building	Af	=	**9.68E+00**	m2
Interior Height of building	R_h	=	2.44E+00	m
Volume of building	V	=	**2.36E+03**	m3
Exchange rate of air	E	=	8.30E-01	exchanges/hr
Ventilation rate	Q	=	**1.96E+03**	m3/hr
Indoor air component	**C_i**	=	**9.72E-06**	**mg/m3**

B. OUTDOOR AIR COMPONENT

Downwind contamination length	L	=		m
Wind speed	u	=		m/hr
Height of building openings (or height of breathing zone)	h	=		m
Outdoor air component	**C_o**	=	**0.00E+00**	**mg/m3**
C. TOTAL INDOOR AIR CONCENTRATION	**C_t**	=	**9.72E-06**	**mg/m3**

EXPOSURE SCENARIO

Body weight	BW	=	7.00E+01	kg
Inhalation rate	IR	=	2.00E+01	m3/day
Exposure duration	ED	=	2.50E+01	yrs
Hours per day	conversion		8.00E+00	hr/day
Exposure time	ET	=	**3.33E-01**	hr/24 hours
Days per week	conversion		2.50E+00	days/week
Weeks per year	conversion		5.00E+01	weeks/yr
Exposure frequency	EF	=	**1.25E+02**	days/yr
Averaging Time (carc. risk)	AT	=	2.56E+04	days
Averaging Time (non-carc. risk)	AT	=	**9.13E+03**	days
Chemical Intake (carc. risk)	**IT_c**	=	**1.13E-07**	**mg/kg-day**
Chemical Intake (non-carc. risk)	**IT_{nc}**	=	**3.17E-07**	**mg/kg-day**

NON-CARCINOGENIC RISK (Chronic Risk)

Chemical Intake (non-carc. risk)	**IT_{nc}**	=	3.17E-07	mg/kg-day
Reference dose	RfD	=	1.00E-02	mg/kg-day
Hazard Index	**HI**	=	**3.17E-05**	

CARCINOGENIC RISK

Chemical Intake (carc. risk)	IT_c	=	1.13E-07	mg/kg-day
Slope factor (potency)	SF	=	2.10E-02	1/(mg/kg-day)
Cancer Risk	**Risk**	=	**2.37E-09**	

Risk Calculations Version: November 1999

Project Name: BRC Former Boeing C-6 Facility, Los Angeles, California

Chemical: 1,1,1-Trichloroethane (1,1,1-TCA)

Variable Descriptions				Units
CALCULATION OF SOIL GAS CONCENTRATION				
A. SOURCE - Free Product/Soil>100mg/kg.				
Mole fraction	MF	=	0.00E+00	dimensionless
Molecular weight	MW	=	1.30E+05	mg/mole
Vapor pressure	VP	=	1.63E-01	atm
Universal gas constant	R	=	8.20E-05	atm-m3/mole-K
Temperature	T	=	2.93E+02	K
Calculated soil gas concentration	**C_{sg}(fp)**	=	**0.00E+00**	**mg/m3**
B. SOURCE - Groundwater				
Water contamination level	C_w	=	2.20E+00	ug/l
Henry's Law Constant	H	=	7.10E-01	dimensionless
Calculated soil gas concentration	**C_{sg}(gw)**	=	**1.56E+00**	**mg/m3**
C. SOURCE - Soil < 100 mg/kg				
Soil contamination level	C_t	=		mg/kg
Henry's Law Constant	H	=	7.10E-01	dimensionless
Bulk density (dry)	ρ_b	=	1.50E+00	gm/cc
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Water-filled porosity	θ_w	=	1.50E-01	dimensionless
Weight fraction of organic carbon	f_{oc}	=	4.00E-03	dimensionless
Organic carbon partition coefficient	K_{oc}	=	1.40E+02	cm3/gm
Soil/water distribution coef.	K_d	=	**5.60E-01**	cm3/gm
Calculated soil gas concentration	**C_{sg}(s)**	=	**0.00E+00**	**mg/m3**
D. SOURCE - Measured Soil Gas				
Measured soil gas concentration	**C_{sg}(m)**	=		**mg/m3 (ug/l)**

E. SOIL GAS CONCENTRATION USED IN RISK CALCULATIONS >>>> 1.56E+00 mg/m3

DIFFUSIVE TRANSPORT UPWARD IN UNSATURATED ZONE				
Total porosity	θ	=	4.34E-01	dimensionless
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Diffusion coefficient in air	D_a	=	7.80E-02	cm2/sec
Effective diffusion coefficient	**D_e**	=	**6.26E-03**	cm2/sec
Depth of contamination or Csg	X	=	1.98E+01	m
Calculated Flux	**F_x**	=	**1.78E-04**	**mg/m2-hour**

CALCULATING VAPOR CONCENTRATION IN BUILDING

A. INDOOR AIR COMPONENT

Floor area of building	A	=	9.68E+02	m2
% of floor area that flux occurs			1.00E+00	dimensionless
Attenuation factor(Crack factor)	S_b	=	1.00E-02	dimensionless
Flux area within building	Af	=	**9.68E+00**	m2
Interior Height of building	R_h	=	2.44E+00	m
Volume of building	V	=	**2.36E+03**	m3
Exchange rate of air	E	=	8.30E-01	exchanges/hr
Ventilation rate	Q	=	**1.96E+03**	m3/hr
Indoor air component	**C_i**	=	**8.78E-07**	**mg/m3**

B. OUTDOOR AIR COMPONENT

Downwind contamination length	L	=		m
Wind speed	u	=		m/hr
Height of building openings (or height of breathing zone)	h	=		m
Outdoor air component	**C_o**	=	**0.00E+00**	**mg/m3**
C. TOTAL INDOOR AIR CONCENTRATION	**C_t**	=	**8.78E-07**	**mg/m3**

EXPOSURE SCENARIO

Body weight	BW	=	7.00E+01	kg
Inhalation rate	IR	=	2.00E+01	m3/day
Exposure duration	ED	=	2.50E+01	yrs
Hours per day	conversion		8.00E+00	hr/day
Exposure time	ET	=	**3.33E-01**	hr/24 hours
Days per week	conversion		2.50E+00	days/week
Weeks per year	conversion		5.00E+01	weeks/yr
Exposure frequency	EF	=	**1.25E+02**	days/yr
Averaging Time (carc. risk)	AT	=	2.56E+04	days
Averaging Time (non-carc. risk)	AT	=	**9.13E+03**	days
Chemical Intake (carc. risk)	**IT_c**	=	**1.02E-08**	**mg/kg-day**
Chemical Intake (non-carc. risk)	**IT_{nc}**	=	**2.86E-08**	**mg/kg-day**

NON-CARCINOGENIC RISK (Chronic Risk)

Chemical Intake (non-carc. risk)	**IT_{nc}**	=	2.86E-08	mg/kg-day
Reference dose	RfD	=	2.86E-01	mg/kg-day
Hazard Index	**HI**	=	**1.00E-07**	

CARCINOGENIC RISK

Chemical Intake (carc. risk)	IT_c	=	1.02E-08	mg/kg-day
Slope factor (potency)	SF	=	0.00E+00	1/(mg/kg-day)
Cancer Risk	**Risk**	=	**No Slope Factor**	

Risk Calculations Version: November 1999

Project Name: BRC Former Boeing C-6 Facility, Los Angeles, California

Chemical: 1,1,2 - TCA

Variable Descriptions				Units
CALCULATION OF SOIL GAS CONCENTRATION				
A. SOURCE - Free Product/Soil>100mg/kg.				
Mole fraction	MF	=	0.00E+00	dimensionless
Molecular weight	MW	=	1.30E+05	mg/mole
Vapor pressure	VP	=	3.10E-02	atm
Universal gas constant	R	=	8.20E-05	atm-m3/mole-K
Temperature	T	=	2.93E+02	K
Calculated soil gas concentration	**C_{sg}(fp)**	=	**0.00E+00**	**mg/m3**
B. SOURCE - Groundwater				
Water contamination level	C_w	=	4.30E+00	ug/l
Henry's Law Constant	H	=	3.70E-02	dimensionless
Calculated soil gas concentration	**C_{sg}(gw)**	=	**1.59E-01**	**mg/m3**
C. SOURCE - Soil < 100 mg/kg				
Soil contamination level	C_t	=		mg/kg
Henry's Law Constant	H	=	3.70E-02	dimensionless
Bulk density (dry)	ρ_b	=	1.50E+00	gm/cc
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Water-filled porosity	θ_w	=	1.50E-01	dimensionless
Weight fraction of organic carbon	f_{oc}	=	4.00E-03	dimensionless
Organic carbon partition coefficient	K_{oc}	=	7.50E+01	cm3/gm
Soil/water distribution coef.	K_d	=	**3.00E-01**	cm3/gm
Calculated soil gas concentration	**C_{sg}(s)**	=	**0.00E+00**	**mg/m3**
D. SOURCE - Measured Soil Gas				
Measured soil gas concentration	**C_{sg}(m)**	=		**mg/m3 (ug/l)**

E. SOIL GAS CONCENTRATION USED IN RISK CALCULATIONS >>>> 1.59E-01 mg/m3

DIFFUSIVE TRANSPORT UPWARD IN UNSATURATED ZONE				
Total porosity	θ	=	4.34E-01	dimensionless
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Diffusion coefficient in air	D_a	=	7.80E-02	cm2/sec
Effective diffusion coefficient	**D_e**	=	**6.26E-03**	cm2/sec
Depth of contamination or Csg	X	=	1.98E+01	m
Calculated Flux	**F_x**	=	**1.81E-05**	**mg/m2-hour**

Risk Calculations Version: November 1999

CALCULATING VAPOR CONCENTRATION IN BUILDING

A. INDOOR AIR COMPONENT

Floor area of building	A	=	9.68E+02	m2
% of floor area that flux occurs			1.00E+00	dimensionless
Attenuation factor(Crack factor)	S_b	=	1.00E-02	dimensionless
Flux area within building	Af	=	**9.68E+00**	m2
Interior Height of building	R_h	=	2.44E+00	m
Volume of building	V	=	**2.36E+03**	m3
Exchange rate of air	E	=	8.30E-01	exchanges/hr
Ventilation rate	Q	=	**1.96E+03**	m3/hr
Indoor air component	**C_i**	=	**8.94E-08**	**mg/m3**

B. OUTDOOR AIR COMPONENT

Downwind contamination length	L	=		m
Wind speed	u	=		m/hr
Height of building openings (or height of breathing zone)	h	=		m
Outdoor air component	**C_o**	=	**0.00E+00**	**mg/m3**
C. TOTAL INDOOR AIR CONCENTRATION	**C_t**	=	**8.94E-08**	**mg/m3**

EXPOSURE SCENARIO

Body weight	BW	=	7.00E+01	kg
Inhalation rate	IR	=	2.00E+01	m3/day
Exposure duration	ED	=	2.50E+01	yrs
Hours per day	conversion		8.00E+00	hr/day
Exposure time	ET	=	**3.33E-01**	hr/24 hours
Days per week	conversion		2.50E+00	days/week
Weeks per year	conversion		5.00E+01	weeks/yr
Exposure frequency	EF	=	**1.25E+02**	days/yr
Averaging Time (carc. risk)	AT	=	2.56E+04	days
Averaging Time (non-carc. risk)	AT	=	**9.13E+03**	days
Chemical Intake (carc. risk)	**IT_c**	=	**1.04E-09**	**mg/kg-day**
Chemical Intake (non-carc. risk)	**IT_{nc}**	=	**2.92E-09**	**mg/kg-day**

NON-CARCINOGENIC RISK (Chronic Risk)

Chemical Intake (non-carc. risk)	**IT_{nc}**	=	2.92E-09	mg/kg-day
Reference dose	RfD	=	4.00E-03	mg/kg-day
Hazard Index	**HI**	=	**7.29E-07**	

CARCINOGENIC RISK

Chemical Intake (carc. risk)	IT_c	=	1.04E-09	mg/kg-day
Slope factor (potency)	SF	=	5.70E-02	1/(mg/kg-day)
Cancer Risk	**Risk**	=	**5.92E-11**	

Risk Calculations Version: November 1999

Project Name: BRC Former Boeing C-6 Facility, Los Angeles, California

Chemical: Trichloroethlyene (TCE)

Variable Descriptions				Units
CALCULATION OF SOIL GAS CONCENTRATION				
A. SOURCE - Free Product/Soil>100mg/kg.				
Mole fraction	MF	=	0.00E+00	dimensionless
Molecular weight	MW	=	1.30E+05	mg/mole
Vapor pressure	VP	=	7.61E-02	atm
Universal gas constant	R	=	8.20E-05	atm-m3/mole-K
Temperature	T	=	2.93E+02	K
Calculated soil gas concentration	**C_{sg}(fp)**	=	**0.00E+00**	**mg/m3**
B. SOURCE - Groundwater				
Water contamination level	C_w	=	6.00E+01	ug/l
Henry's Law Constant	H	=	4.20E-01	dimensionless
Calculated soil gas concentration	**C_{sg}(gw)**	=	**2.52E+01**	**mg/m3**
C. SOURCE - Soil < 100 mg/kg				
Soil contamination level	C_t	=		mg/kg
Henry's Law Constant	H	=	4.20E-01	dimensionless
Bulk density (dry)	ρ_b	=	1.50E+00	gm/cc
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Water-filled porosity	θ_w	=	1.50E-01	dimensionless
Weight fraction of organic carbon	f_{oc}	=	4.00E-03	dimensionless
Organic carbon partition coefficient	K_{oc}	=	9.40E+01	cm3/gm
Soil/water distribution coef.	K_d	=	**3.76E-01**	cm3/gm
Calculated soil gas concentration	**C_{sg}(s)**	=	**0.00E+00**	**mg/m3**
D. SOURCE - Measured Soil Gas				
Measured soil gas concentration	**C_{sg}(m)**	=		**mg/m3 (ug/l)**

E. SOIL GAS CONCENTRATION USED IN RISK CALCULATIONS >>>> 2.52E+01 mg/m3

DIFFUSIVE TRANSPORT UPWARD IN UNSATURATED ZONE				
Total porosity	θ	=	4.34E-01	dimensionless
Air-filled porosity	θ_a	=	2.84E-01	dimensionless
Diffusion coefficient in air	D_a	=	7.90E-02	cm2/sec
Effective diffusion coefficient	**D_e**	=	**6.34E-03**	cm2/sec
Depth of contamination or Csg	X	=	1.98E+01	m
Calculated Flux	**F_x**	=	**2.90E-03**	**mg/m2-hour**

CALCULATING VAPOR CONCENTRATION IN BUILDING

A. INDOOR AIR COMPONENT

Floor area of building	A	=	9.68E+02	m2
% of floor area that flux occurs			1.00E+00	dimensionless
Attenuation factor(Crack factor)	S_b	=	1.00E-02	dimensionless
Flux area within building	Af	=	**9.68E+00**	m2
Interior Height of building	R_h	=	2.44E+00	m
Volume of building	V	=	**2.36E+03**	m3
Exchange rate of air	E	=	8.30E-01	exchanges/hr
Ventilation rate	Q	=	**1.96E+03**	m3/hr
Indoor air component	**C_i**	=	**1.43E-05**	**mg/m3**

B. OUTDOOR AIR COMPONENT

Downwind contamination length	L	=		m
Wind speed	u	=		m/hr
Height of building openings (or height of breathing zone)	h	=		m
Outdoor air component	**C_o**	=	**0.00E+00**	**mg/m3**
C. TOTAL INDOOR AIR CONCENTRATION	**C_t**	=	**1.43E-05**	**mg/m3**

EXPOSURE SCENARIO

Body weight	BW	=	7.00E+01	kg
Inhalation rate	IR	=	2.00E+01	m3/day
Exposure duration	ED	=	2.50E+01	yrs
Hours per day	conversion		8.00E+00	hr/day
Exposure time	ET	=	**3.33E-01**	hr/24 hours
Days per week	conversion		2.50E+00	days/week
Weeks per year	conversion		5.00E+01	weeks/yr
Exposure frequency	EF	=	**1.25E+02**	days/yr
Averaging Time (carc. risk)	AT	=	2.56E+04	days
Averaging Time (non-carc. risk)	AT	=	**9.13E+03**	days
Chemical Intake (carc. risk)	**IT_c**	=	**1.67E-07**	**mg/kg-day**
Chemical Intake (non-carc. risk)	**IT_{nc}**	=	**4.68E-07**	**mg/kg-day**

NON-CARCINOGENIC RISK (Chronic Risk)

Chemical Intake (non-carc. risk)	**IT_{nc}**	=	4.68E-07	mg/kg-day
Reference dose	RfD	=	1.71E-01	mg/kg-day
Hazard Index	**HI**	=	**2.73E-06**	

CARCINOGENIC RISK

Chemical Intake (carc. risk)	IT_c	=	1.67E-07	mg/kg-day
Slope factor (potency)	SF	=	1.00E-02	1/(mg/kg-day)
Cancer Risk	**Risk**	=	**1.67E-09**	

CHEMICAL PARAMETERS

CAS No.		MW (mg/mole)		H' (dimensionless)		Da (cm^2/sec)		VP (atm)	Temp. (°C)		K_{oc} (cm^3/g)		Water Solubility (mg/L-water)		CSF (inh) (mg/kg-day)$^{-1}$		Chronic RfD (inh) (mg/kg-day)	
127-18-4	Tetrachloroethylene (PCE)	1.7E+05	a	7.5E-01	a	7.2E-02	a	2.4E-02	25	b	2.7E+02	a	2.0E+02	a	2.1E-02	c	1.0E-02	e
75-09-2	Methylene Chloride	8.5E+04	a	9.0E-02	a	1.0E-01	a	5.7E-01	25	b	1.0E+01	a	1.3E+04	a	3.5E-03	c	1.1E-01	e
67-66-3	Chloroform	1.2E+05	a	1.5E-01	a	1.0E-01	a	2.6E-01	25	b	5.3E+01	a	7.9E+03	a	1.9E-02	c	8.6E-02	e
95-63-6	1,2,4 - Trimethylbenzene	1.2E+05	a	2.3E-01	a	7.5E-02	a	2.8E-03	25	b	3.7E+03	a	2.6E-01	a	0.00E+00		1.70E-03	
78-93-3	Methyl Ethyl Ketone	7.2E+04	a	1.1E-03	a	9.0E-02	a	1.2E-01	25	b	4.5E+00	a	2.7E+05	a	0.00E+00		1.43E-01	
71-43-2	Benzene	7.8E+04	a	2.3E-01	a	8.8E-02	a	1.2E-01	25	b	6.2E+01	a	1.8E+03	a	1.00E-01		1.71E-02	
75-15-0	Carbon disulfide	7.6E+04	a	1.2E+00	a	1.0E-01	a	4.7E-01	25	b	4.6E+01	a	1.2E+03	a	0.00E+00		2.00E-01	
56-23-5	Carbon tetrachloride	1.5E+05	a	1.2E+00	a	7.8E-02	a	1.5E-01	25	b	1.5E+02	a	7.9E+02	a	1.50E-01		1.14E-02	
156-59-2	cis-1,2-Dichloroethylene (cis 1,2-DCE)	9.7E+04	a	1.7E-01	a	7.4E-02	a	2.4E-04	20	b	3.6E+01	a	3.5E+03	a	0.00E+00		1.00E-02	
100-41-4	Ethylbenzene	1.1E+05	a	3.2E-01	a	7.5E-02	a	1.3E-02	25	b	2.0E+02	a	1.7E+02	a	0.00E+00		5.71E-01	
98-82-8	Isopropyl-benzene (cumene, 1-methyethyl benzene)	1.2E+05	a	4.9E+01	a	7.5E-02	a	5.9E-03	25	b	2.2E+02	a	6.1E+01	a	0.00E+00		1.10E-01	
75-01-4	Vinyl chloride	6.3E+04	a	1.1E+00	a	1.1E-01	a	########	25	b	1.9E+01	a	2.8E+03	a	2.70E-01		7.43E-03	
1330-20-7	Xylenes	1.1E+05	a	3.0E-01	a	7.0E-02	a	1.1E-02	25	b	2.0E+02	a	1.6E+02	a	0.00E+00		2.00E-01	
104-51-8	n-butylbenzene	1.3E+05	a	5.4E-01	a	7.5E-02	a	1.3E-03	23	d	2.8E+03	a	1.4E+01	a	0.00E+00		1.00E-02	
135-98-8	sec-butylbenzene	1.3E+05	a	7.7E-01	a	7.5E-02	a	1.4E-03	20	d	2.2E+03	a	1.7E+01	a	0.00E+00		1.00E-02	
103-65-1	n-propylbenzene	1.2E+05	b	5.4E-01	a	7.5E-02	a	1.3E-03	6.3	b	2.8E+03	a	1.4E+01	a	0.00E+00		1.00E-02	
108-88-3	Toluene	9.2E+04	a	2.7E-01	a	8.7E-02	a	3.7E-02	25	b	1.4E+02	a	5.3E+02	a	0.00E+00		8.57E-02	
156-60-5	trans-1,2-Dichloroethylene (trans-1,2-DCE)	9.7E+04	a	3.8E-01	a	7.1E-02	a	5.2E-01	30	b	3.8E+01	a	6.3E+03	a	0.00E+00		2.00E-02	
79-01-6	Trichloroethlyene (TCE)	1.3E+05	a	4.2E-01	a	7.9E-02	a	7.6E-02	20	b	9.4E+01	a	1.1E+03	a	1.00E-02		1.71E-01	
75-69-4	Trichlorofluoromethane (Freon 11)	1.4E+05	a	4.0E+00	a	8.7E-02	a	########	25	b	1.6E+02	a	1.1E+03	a	0.00E+00		2.00E-01	
108-10-1	4-Methyl-2-pentanone (MIBK)	1.0E+05	a	5.7E-03	a	7.5E-02	a	2.6E-02	25	b	1.3E+02	a	1.9E+04	a	0.00E+00		2.29E-02	
108-67-8	1,3,5 - Trimethylbenzene	1.2E+05	a	3.2E-01	a	7.5E-02	a	3.3E-03	25	b	8.2E+02	a	5.0E+01	a	0.00E+00		1.70E-03	
75-34-3	1,1 - Dichloroethane (1,1-DCA)	9.9E+04	a	2.3E-01	a	7.4E-02	a	3.1E-01	25	b	5.3E+01	a	5.1E+03	a	5.70E-03		1.40E-01	
107-06-2	1,2-Dichloroethane (EDC)	9.9E+04	a	4.0E-02	a	1.0E-01	a	1.1E-01	25	b	3.8E+01	a	8.5E+03	a	7.00E-02		1.14E-01	
75-35-4	1,1-Dichloroethylene (1,1-DCE)	9.7E+04	a	1.1E+00	a	9.0E-02	a	7.8E-01	25	b	6.5E+01	a	2.3E+03	a	1.75E-01		2.00E-02	
71-55-6	1,1,1-Trichloroethane (1,1,1-TCA)	1.3E+05	a	7.1E-01	a	7.8E-02	a	1.6E-01	25	b	1.4E+02	a	1.3E+03	a	0.00E+00		2.86E-01	
79-00-5	1,1,2 - TCA	1.3E+05	a	3.7E-02	a	7.8E-02	a	3.1E-02	25	b	7.5E+01	a	4.4E+03	a	5.70E-02		4.00E-03	

References:

a EPA Region 9, Preliminary Remediation Goals (PRGs), 2000.

b U.S. National Library of Medicine Hazardous Substance Data Bank (HSDB), http://www.nlm.nih.gov/pubs/factsheets/hsdbfs.html

c Cal-EPA Office of Environmental Health Hazard Assessment (OEHHA), Toxicity Criteria Database and December 2000 California Cancer Potency Values, http://www.oehha.ca.gov/risk/chemicalDB/index.asp

d Risk Assessment Information System (RAIS) Toxicity & Chemical-Specific Factors Data Base, January 2001, http://risk.lsd.ornl.gov/cgi-bin/tox/TOX_select?select=csf

e Cal-EPA, Air Resources Board (ARB), Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values, October 10, 2000, http://www.arb.ca.gov/ab2588/riskassess.htm

Toxicity Value reference priority:

1. Cal-EPA Office of Environmental Health Hazard Assessment (OEHHA), Toxicity Criteria Database and December 2000 California Cancer Potency Values, http://www.oehha.ca.gov/risk/chemicalDB/index.asp
2. Cal-EPA, Air Resources Board (ARB), Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values, October 10, 2000, http://www.arb.ca.gov/ab2588/riskassess.htm
3. EPA Region 9, Preliminary Remediation Goals (PRGs), 2000.

Appendix B

Declaration of Restrictive Covenants

CHICAGO TITLE COMPANY

WHEN RECORDED, MAIL TO:

BOEING REALTY CORPORATION
4060 Lakewood Boulevard, 6th Floor
Long Beach, California 90808-1700
Attn: S. Mario Stavale

12/29/98 4:21

COPY of Document Recorded

Has not been compared with original
Original will be returned when
processing has been completed.

LOS ANGELES COUNTY REGISTRAR-RECORDER COUNTY CLERK

98 2372365

7326026-M19 (Space Above Line for Recorder's Use Only)

DECLARATION OF RESTRICTIVE COVENANTS

This Declaration of Restrictive Covenants is made as of December 28, 1998 by BOEING REALTY CORPORATION, a California corporation (formerly known as McDonnell Douglas Realty Company) ("**Declarant**"), pertaining to the approximately 170-acre tract described in Exhibit "A" attached hereto in the City of Los Angeles, California (the "**Property**").

Declarant hereby declares, for itself and all successors and assigns in all or any portion of the Property, that the Property shall be, sold, leased and conveyed subject to the following covenants, conditions and restrictions in perpetuity:

(i) Development of the Property shall be limited to commercial and industrial uses;

(ii) The Property shall not be used for agricultural purposes;

(iii) No drinking water production wells shall be installed on the Property;

(iv) No portion of the Property shall be used for residential purposes, hospitals for humans, health care facilities, schools for persons under 21 years of age, day-care centers for children (except those offered as a service in connection with a hotel, motel or temporary lodging facility) or any permanently occupied human habitation, including hotels and motels which are used as permanent residences (but not including, and instead permitting, hotels, motels and temporary lodging facilities which allow for temporary or extended stays).

The covenants, conditions and restrictions declared herein are interests in the Property which shall be appurtenant to and shall run with the Property, and the benefits and burdens of which shall bind and benefit all parties having or acquiring any right, title or interest in all or any portion of the Property. Upon recordation of this Declaration, every person or entity that now or hereafter owns or acquires any right, title or interest in or to all or any portion of the Property is and shall be conclusively deemed to have consented and agreed to every provision of this Declaration and every covenant, condition, and restriction created by this Declaration, whether or not any reference to this Declaration is contained in the instrument by which such person or entity acquired such interest in the Property. This Declaration is made for the direct, mutual and reciprocal benefit of all portions of the Property and shall create reciprocal rights and obligations as set forth in this Declaration.

Notwithstanding any provision of this Declaration, no breach of the covenants, conditions or restrictions, nor the enforcement of any provisions contained in this Declaration shall affect, impair, or defeat the lien or charge of any duly recorded mortgage or deed of trust encumbering any portion on the Property, or affect, impair, or defeat the interest of the mortgagee, or its successor by merger or acquisition, or any entity in which the mortgagee or such successor has a substantial direct or indirect ownership interest, or any entity which has a substantial direct or indirect ownership interest in the mortgagee (the mortgagee and such parties are collectively referred to as the "**Mortgagee**") pursuant to such a mortgage, provided that such mortgage is

made in good faith and for value. Except as provided in this paragraph, all covenants, conditions, restrictions, and provisions of this Declaration shall be binding upon and effective against any owners whose title is derived through foreclosure, deed in lieu of foreclosure, or trustee's sale during the period of their ownership, provided that no indemnity obligation under this Declaration shall bind or be effective against the Mortgagee or its first successor in interest or the grantee under a foreclosure, deed in lieu of foreclosure, or a trustee's sale conducted in connection with any Mortgagee's security interest in the Property.

This Declaration may be amended or terminated, or any provisions hereof modified or waived, only upon the prior written consent of (i) the Los Angeles Regional Water Quality Control Board ("Water Board") (or its successor or designee from time to time having primary jurisdiction as "lead agency" over the environmental condition of the Property) and (ii) the party owning the parcel as to which such amendment, termination, modification or waiver will apply and (iii) parties owning a majority of the Property (based on acreage). Any such termination, amendment, modification or waiver shall be effective upon the recording in the Official Records of Los Angeles County of an appropriate instrument in writing, executed and acknowledged by such majority of owners of the Property and approved by the Water Board (or such successor or designee).

IN WITNESS WHEREOF, Declarant has executed this instrument as of the date and year first written above.

BOEING REALTY CORPORATION, a California corporation (formerly known as McDonnell Douglas Realty Company)

By: _____

Stephen J. Barker,
Director of Business Operations

EXHIBIT "A"
TO DECLARATION OF RESTRICTIVE COVENANTS

THAT PORTION OF RANCHO SAN PEDRO, IN THE CITY OF LOS ANGELES, COUNTY OF LOS ANGELES, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT IN THE WEST LINE OF THE 50-FOOT RIGHT-OF-WAY OF THE PACIFIC ELECTRIC RAILWAY COMPANY ADJOINING NORMANDIE AVENUE ON THE WEST, DISTANT NORTHERLY 780 FEET MEASURED AT RIGHT ANGLES FROM THE EASTERLY PROLONGATION OF THE NORTHERLY LINE OF LOT 9 IN BLOCK 72 OF TRACT NO. 4983, IN THE CITY OF LOS ANGELES, COUNTY OF LOS ANGELES, STATE OF CALIFORNIA, AS PER MAP RECORDED IN BOOK 58 PAGES 80, ET SEQ., OF MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID LOS ANGELES COUNTY, AS DESCRIBED IN THAT CERTAIN DEED TO THE UNITED STATES OF AMERICA, RECORDED AS DOCUMENT NO. 1720 IN BOOK 40472 PAGE 23 OF OFFICIAL RECORDS, OF SAID LOS ANGELES COUNTY; THENCE WESTERLY ALONG THE LINE DESCRIBED IN PARCEL "A" OF SAID DEED RECORDED IN BOOK 40472 PAGE 23, OFFICIAL RECORDS, PARALLEL WITH THE NORTH LINE OF SAID LOT 9 AND ITS PROLONGATIONS, 1050 FEET; THENCE SOUTH 0 DEGREES 02 MINUTES 40 SECONDS EAST ALONG THE LINE DESCRIBED IN SAID PARCEL "A", 780 FEET; THENCE NORTH 89 DEGREES 59 MINUTES 31 SECONDS WEST ALONG THE LINE DESCRIBED IN SAID PARCEL "A" 1887.60 FEET TO THE EASTERLY LINE OF WESTERN AVENUE, 80 FEET WIDE, AS SHOWN ON RIGHT-OF-WAY, FILED IN BOOK 52 PAGE 47 OF RECORD OF SURVEYS OF SAID LOS ANGELES COUNTY; THENCE NORTH 0 DEGREES 22 MINUTES 04 SECONDS WEST 1230.35 FEET ALONG SAID EASTERLY LINE OF WESTERN AVENUE TO THE SOUTHWESTERN TERMINUS OF THAT CERTAIN COURSE DESCRIBED IN PARCEL NO. 1 OF THE QUITCLAIM DEED OF HARVEY ALUMINUM, INC., RECORDED IN BOOK D-586 PAGE 796, OFFICIAL RECORDS OF SAID LOS ANGELES COUNTY, HAVING A BEARING OF SOUTH 89 DEGREES 37 MINUTES 56 SECONDS WEST AND A DISTANCE OF 10.00 FEET; THENCE NORTH 89 DEGREES 37 MINUTES 56 SECONDS EAST 10.00 FEET; THENCE CONTINUING ALONG THE LINE DESCRIBED IN PARCEL NO. 1 OF SAID DEED, RECORDED IN BOOK D-586 PAGE 796 OF SAID OFFICIAL RECORDS, SOUTH 0 DEGREES 22 MINUTES 04 SECONDS EAST 172.51 FEET; THENCE NORTH 89 DEGREES 37 MINUTES 56 SECONDS EAST 6.55 FEET; THENCE SOUTH 0 DEGREES 22 MINUTES 04 SECONDS EAST 84.12 FEET; THENCE SOUTH 45 DEGREES 11 MINUTES 14 SECONDS EAST 158.41 FEET; THENCE NORTH 89 DEGREES 59 MINUTES 41 SECONDS EAST 960.03 FEET TO THE SOUTHWEST CORNER OF PARCEL 2 OF SAID QUITCLAIM DEED, RECORDED IN BOOK D-586 PAGE 796, OFFICIAL RECORDS; THENCE NORTH 89 DEGREES 58 MINUTES 11 SECONDS EAST ALONG THE SOUTHERLY LINE OF SAID PARCEL NO. 2, 33.60 FEET; THENCE ALONG THE EASTERLY LINE OF SAID PARCEL NO. 2, NORTH 0 DEGREES 02 MINUTES 12 SECONDS WEST 2731.90 FEET TO THE BEGINNING OF A TANGENT CURVE CONCAVE SOUTHEASTERLY, HAVING A RADIUS OF 403.00 FEET; THENCE NORTHEASTERLY ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 39 DEGREES 15 MINUTES 34 SECONDS, A DISTANCE OF 276.14 FEET TO A POINT, A RADIAL THROUGH SAID POINT BEARS NORTH 50 DEGREES 56 MINUTES 38 SECONDS WEST; THENCE LEAVING SAID CURVE, NORTH 0 DEGREES 02 MINUTES 44 SECONDS WEST 161.13 FEET TO A POINT IN THE SOUTHERLY LINE OF 190TH STREET, 66 FEET WIDE, AS SHOWN IN BOOK 52 PAGE 47 OF RECORD OF SURVEYS OF SAID LOS ANGELES COUNTY, SAID POINT BEING THE NORTHEASTERLY CORNER OF PARCEL NO. 2 OF SAID QUITCLAIM DEED, RECORDED IN BOOK D-586 PAGE 796, OFFICIAL RECORDS; THENCE ALONG THE SOUTHERLY LINE OF 190TH STREET, NORTH 89 DEGREES 56 MINUTES 46 SECONDS EAST 1729.56 FEET TO AN INTERSECTION WITH THE WESTERLY LINE OF SAID FIRST-MENTIONED 50-FOOT RIGHT-OF-WAY OF THE PACIFIC ELECTRIC RAILWAY COMPANY; THENCE ALONG SAID WESTERLY LINE OF SAID 50-FOOT RIGHT-OF-WAY, SOUTH 0 DEGREES 02 MINUTES 40 SECONDS EAST 3232.35 FEET TO THE POINT OF BEGINNING.

DESCRSO – 12/04/91 AA

12-18-98 6002-00034
S:\111\98120020.CD

STATE OF CALIFORNIA)
) SS.
COUNTY OF Orange)

On December 28, 1998 before me, L. Beasley

a Notary Public in and for said County and State, personally appeared Stephen J. Barker

personally known to me (or proved to me on the basis of satisfactory evidence) to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

WITNESS my hand and official seal.

L. Beasley
Signature of Notary

L BEASLEY
Commission # 1102077
Notary Public — California
Orange County
My Comm. Expires Jun 20, 2000

STATE OF CALIFORNIA)
) SS.
COUNTY OF _____)

On _____ before me, _____

a Notary Public in and for said County and State, personally appeared _____

personally known to me (or proved to me on the basis of satisfactory evidence) to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

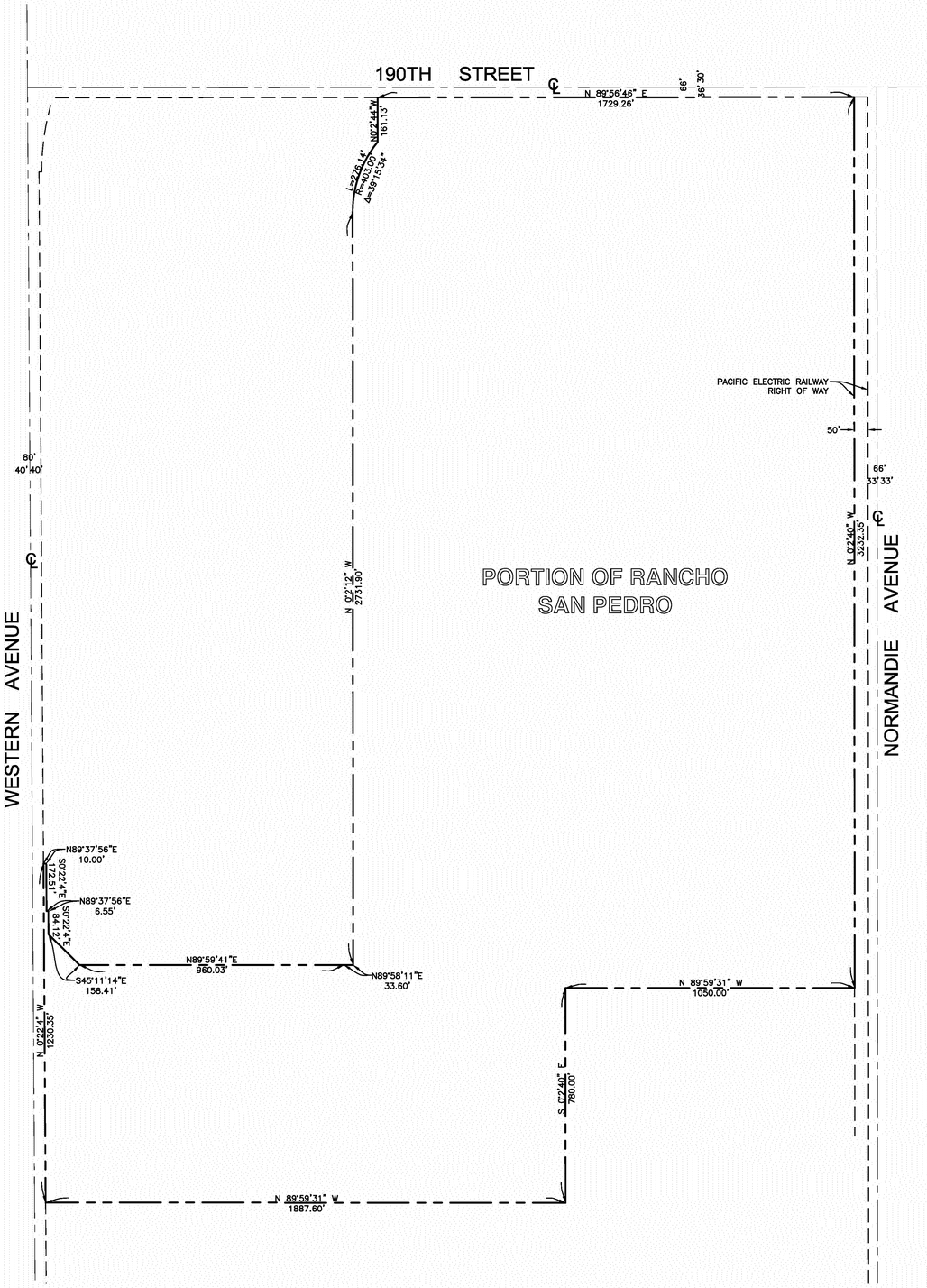
WITNESS my hand and official seal.

_____
Signature of Notary

EXTNOT1 --09/25/96bk

RECORDED BOUNDARY EXHIBIT

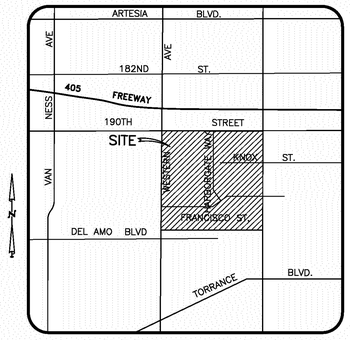
IN THE CITY OF LOS ANGELES, COUNTY OF LOS ANGELES.



GRAPHIC SCALE

0' 200' 400' 600'

SCALE: 1" = 200'



VICINITY MAP

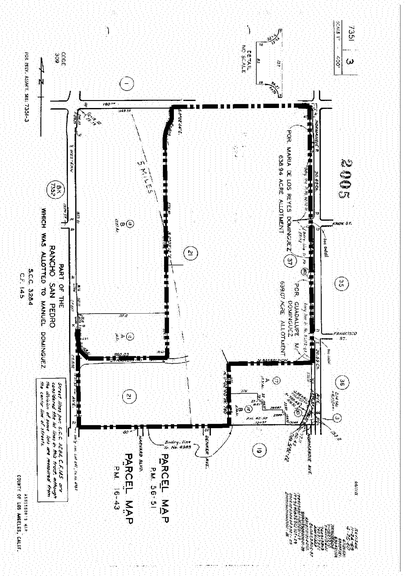
N.T.S

SATELLITE PHOTO

N.T.S

ASSESSORS MAP

N.T.S



LEGAL DESCRIPTION

THAT PORTION OF RANCHO SAN PEDRO, IN THE CITY OF LOS ANGELES, COUNTY OF LOS ANGELES, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT IN THE WEST LINE OF THE 50–FOOT RIGHT–OF–WAY OF THE PACIFIC ELECTRIC RAILWAY COMPANY ADJOINING NORMANDIE AVENUE ON THE WEST, DISTANT NORTHERLY 780 FEET MEASURED AT RIGHT ANGLES FROM THE EASTERLY PROLONGATION OF THE NORTHERLY LINE OF LOT 9 IN BLOCK 72 OF TRACT NO. 4983, IN T HE CITY OF LOS ANGELES, COUNTY OF LOS ANGELES, STATE OF CALIFORNIA, AS PER MAP RECORDED IN BOOK 58 PAGES 80, ET SEQ., OF MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID LOS ANGELES COUNTY, AS DESCRIBED IN THAT CERTAIN DEED TO THE UNITES STATES OF AMERICA, RECORDED AS DOCUMENT NO. 1720 IN BOOK 40472 PAGE 23 OF OFFICIAL RECORDS, OF SAID LOS ANGELES COUNTY; THENCE WESTERLY ALONG THE LINE DESCRIBED IN PARCEL "A" OF SAID DEED IN BOOK 40472 PAGE 23, OFFICIAL RECORDS, PARALLEL WITH THE NORTH LINE OF SAID LOT 9 AND ITS PROLONGATIONS, 1050 FEET; THENCE SOUTH 0 DEGREES 02 MINUTES 40 SECONDS EAST ALONG THE LINE DESCRIBED IN SAID PARCEL "A", 780 FEET; THENCE NORTH 89 DEGREES 59 MINUTES 31 SECONDS WEST ALONG THE LINE DESCRIBED IN SAID PARCEL "A" 1887.60 FEET TO THE EASTERLY LINE OF WESTERN AVENUE, 80 FEET WIDE, AS SHOWN ON RIGHT–OF–WAY, FILED IN BOOK 52 PAGE 47 OF RECORD OF SURVEYS OF SAID LOS ANGELES COUNTY; THENCE NORTH 0 DEGREES 22 MINUTES 04 SECONDS WEST 1230.35 FEET ALONG SAID EASTERLY LINE OF WESTERN AVENUE TO THE SOUTHWESTERN TERMINUS OF THAT CERTAIN COURSE DESCRIBED IN PARCEL NO: 1 OF THE QUITCLAIM DEED OF HARVEY ALUMINUM, INC., RECORDED IN BOOK D–586 PAGE 796, OFFICIAL RECORDS OF SAID LOS ANGELES COUNTY, HAVING A BEARING OF SOUTH 89 DEGREES 37 MINUTES 56 SECONDS WEST AND A DISTANCE OF 10.00 FEET; THENCE NORTH 89 DEGREES 37 MINUTES 56 SECONDS EAST 10.00 FEET; THENCE CONTINUING ALONG THE LINE DESCRIBED IN PARCEL NO. 1 OF SAID DEED, RECORDED IN BOOK D–586 PAGE 795 OF OFFICIAL RECORDS, SOUTH 0 DEGREES 22 MINUTES 04 SECONDS EAST 172.51 FEET; THENCE NORTH 89 DEGREES 37 MINUTES 56 SECONDS EAST 6.55 FEET, THENCE SOUTH 0 DEGREES 22 MINUTES 04 SECONDS EAST 84.12 FEET; THENCE SOUTH 45 DEGREES 11 MINUTES 14 SECONDS EAST 158.41 FEET; THENCE NORTH 89 DEGREES 59 MINUTES 41 SECONDS EAST 960.03 FEET TO THE SOUTHWEST CORNER OF PARCEL 2 OF SAID QUITCLAIM DEED, RECORDED IN BOOK D–586 PAGE 796, OFFICIAL RECORDS; THENCE NORTH 89 DEGREES 58 MINUTES 11 SECONDS EAST ALONG THE SOUTHERLY LINE OF SAID PARCEL NO. 2, 33.60 FEET, THENCE ALONG THE EASTERLY LINE OF SAID PARCEL NO. 2, NORTH 0 DEGREES 02 MINUTES 12 SECONDS WEST 2731.90 FEET TO THE BEGINNING OF A TANGENT CURVE CONCAVE SOUTHEASTERLY, HAVING A RADIUS OF 403.00 FEET; THENCE NORTHEASTERLY ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 39 DEGREES 15 MINUTES 34 SECONDS A DISTANCE OF 276.14 FEET TO A POINT, A RADIAL THROUGH SAID POINT BEARS NORTH 50 DEGREES 56 MINUTES 38 SECONDS WEST; THENCE LEAVING SAID CURVE, NORTH 0 DEGREES 02 MINUTES 44 SECONDS WEST 161.13 FEET TO A POINT IN THE SOUTHERLY LINE OF 190TH STREET, 66 FEET WIDE, AS SHOWN IN BOOK 52 PAGE 47 OF RECORD OF SURVEYS OF SAID LOS ANGELES COUNTY, SAID POINT BEING THE NORTHEASTERLY CORNER OF PARCEL NO. 2 OF SAID QUITCLAIM DEED, RECORDED IN BOOK D–586 PAGE796, OFFICIAL RECORDS; THENCE ALONG THE SOUTHERLY LINE OF 190TH STREET, NORTH 89 DEGREES 56 MINUTES 46 SECONDS EAST 1729.56 FEET TO AN INTERSECTION WITH THE WESTERLY LINE OF SAID FIRST–MENTIONED 50–FOOT RIGHT–OF–WAY OF THE PACIFIC ELECTRIC RAILWAY COMPANY; THENCE ALONG SAID WESTERLY LINE OF SAID 50–FOOT RIGHT–OF–WAY, SOUTH 0 DEGREES 02 MINUTES 40 SECONDS EAST 3232.35 FEET TO THE POINT OF BEGINNING.

LAND AREA

AREA= 7,437,959 SQ. FT.
(170.75 ACRES)

BASIS OF BEARINGS

THE BASIS OF BEARING USED ON THIS SURVEY IS THE CENTERLINE OF NORMANDIE AVENUE BEARING SOUTH 00°02'40" EAST AS SHOWN ON RECORD OF SURVEY BOOK 52 PAGE 47 OF MAPS IN THE OFFICE OF THE RECORDER OF LOS ANGELES COUNTY.

NOTE

THIS IS NOT A BOUNDARY SURVEY. INFORMATION SHOWN HEREON IS COMPILED FROM RECORD INFORMATION.

NO.	DATE	REVISION
1		

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www.dcacivileng.com

AVOCET ENVIRONMENTAL
TORRANCE BOEING SITE
CITY OF LOS ANGELES, CA
RECORDED BOUNDARY EXHIBIT

PROFESSIONAL STAMP

REGISTERED PROFESSIONAL ENGINEER
CHARLES S. CUMMINS
NO. 34536
EXP. 9/30/09
CIVIL
STATE OF CALIFORNIA

DATE: 6/09/2007
SCALE: AS SHOWN
DESIGNED: HCK DRAWN: HCK CHECKED: CSC
SHEET NO.
PROJECT NO. 08-1567-3038.000-1028

6/10/2008 12:39 PM
S:\PROJECTS\3038000\DWG\EXHIBIT-BNDY\BNDY-EXHIBIT.dwg

BOE-C6-005873

Appendix C

No Further Action for Shallow Soil in Parcel A, Boeing Realty Corporation (BRC) C-6 Facility, 19503 South Normandie Avenue, Los Angeles (SLIC No. 410)

HALEY& ALDRICH

Cal/EPA

Los Angeles Regional Water Quality Control Board

101 Centre Plaza Drive
Monterey Park, CA
91754-2156
(213) 266-7500
FAX (213) 266-7600

116

Pete Wilson
Governor

April 21, 1998

Mr. Mario Stavale
Boeing Realty Corporation
4060 Lakewood Blvd., 6th Floor
Long Beach, California 90808-1700

NO FURTHER ACTION FOR SHALLOW SOIL: PARCEL A, BOEING REALTY CORPORATION (BRC) C-6 FACILITY, LOS ANGELES (FILE NO. 100.315)(SLIC NO. 410)

This letter confirms the completion of the site investigation, remedial action, and post demolition health risk assessment for shallow soils (0-12 feet below ground surface) at Parcel A, of the Boeing C-6 Facility, located at 19503 South Normandie Avenue in Los Angeles, California. Parcel A consists of 40 acres in the north-east portion of the C-6 Facility and is bordered by 190th Street to the north, and Normandie Avenue to the east. Thank you for your cooperation throughout this investigation. Your willingness and promptness in responding to our inquiries concerning the shallow soil at Parcel A is greatly appreciated.

This Regional Board has provided oversight for the above activities and for review and approval of all information, shown in the attached List of Documents, pertaining to cleanup and closure of this site. Specifically, staff was on site during the demolition of the buildings and foundations, above ground tanks, and associated piping. Oversight was provided for all soil contamination remedial excavation, soil classification and backfill, and off-site disposal, as appropriate, under permits issued by this Board.

In addition, the Department of Toxic Substances Control's (DTSC), Human and Ecological Risk Division (HERD), has provided review and approval of the "Post-Demolition Health Risk Assessment" document which addresses the potential health effects resulting from the residual shallow soil contamination. A summary of potential health effects under the planned commercial/industrial land use activities, as described in the approved Environmental Impact Report for the C-6 Facility, is presented in Table 6-3 of the risk assessment. These risks fall within a range of values that HERD determines to be acceptable for the proposed land use and will not pose significant health risks for future occupants.

Based upon the above information provided to this Board, we have determined that no further action is required for soil investigation and remediation related to the shallow soil (0-12 feet below ground surface) of Parcel A. Therefore, the site is deemed suitable for development.

Please note that BRC will be required to place a deed restriction on the property limiting future development to commercial/industrial uses. The deed restriction will prohibit installation and operation of drinking water production wells on Parcel A.

Also, this Board shall be notified if any soil contamination is encountered during any future development or utility removal excavations.

Prior to abandoning any groundwater monitoring wells, consideration should be given to the utility of these wells for the future work related to neighboring sites, the ongoing subsurface soil and groundwater remediation at Parcel A, and the soil investigation at Parcel B. This cleanup and closure

letter is in conformance to the provisions of State Water Resources Control Board Resolution No. 92-49 (as amended April 21, 1994).

Please note that the Regional Water Quality Control Board approved documents referenced in the attachment are on file, and available for review during normal working hours. Please contact Mr. Michael Sung at (714) 266-7651 to schedule an appointment.

Should you have any questions or comments regarding the above, please contact me at (213) 266-7550.

J.E. ROSS, P.E., Unit Chief
Site Cleanup Unit

Attachment:
cc: Ms. Debbie Oudiz, Office of Scientific Affairs
Ms. Karen Baker, DTSC, Long Beach
Mr. Michael Martin, Department of Fish and Game
Mr. Joe Tramma, SCAQMD
Ms. Gloria Conti, DTSC, Long Beach
Mr. Jeff Dhont, Federal EPA
Mr. J.T. Liu, Business Revitalization Center
Ms. Lillian Conroe, Business Revitalization Center
Mr. Jeff Walden, City of L.A., Mayor's Office
Mr. Frank Bachman, Montrose Chemical Corporation
Mr. Chuck Paine, Shell Chemical Company
Ms. Carol A. Yuge, Lockheed Martin Corporation
Mr. John R. Johnsen, Lockheed Martin Corporation

BOEING C-6 REPORTS, PARCEL A

TITLE	AUTHOR	VOLUME #	DATE
Post Demolition Risk Assessment	IESI		March 1998
Post Demolition Risk Assessment Supplemental Data	IESI	1	March 1998
Post Demolition Risk Assessment Supplemental Data	IESI	1	March 1998
Post Demolition Risk Assessment Supplemental Data	IESI	2	March 1998
Post Demolition Risk Assessment Supplemental Data	IESI	3	March 1998
Post Demolition Risk Assessment Supplemental Data	IESI	5	March 1998
Post Demolition Risk Assessment	IESI		February 1998
Sampling and Analysis Plan	Kennedy/Jenks		June 1997
Phase II Soil Characterization	Kennedy/Jenks		June 1997
Phase II Soil Characterization	Kennedy/Jenks	1	July 1997
Phase II Soil Characterization	Kennedy/Jenks	2	July 1997
Phase II Soil Characterization	Kennedy/Jenks	3	July 1997
Phase II Soil Characterization	Kennedy/Jenks	4	July 1997
Phase II Soil Characterization	Kennedy/Jenks	5	July 1997
Phase II Soil Characterization	Kennedy/Jenks	6	July 1997
Phase II Soil Characterization	Kennedy/Jenks	7	July 1997
Phase II Soil Characterization	Kennedy/Jenks	8	July 1997
Stockpile and Post Remedial Excavation Confirmation Report No. 3	Montgomery Watson		March 1998
Stockpile and Post Remedial Excavation	Montgomery		March 1998

Confirmation Report No. 4	Watson	
Stockpile and Post Remedial Excavation Confirmation Report No. 5	Montgomery Watson	March 1998
Stockpile and Post Remedial Excavation Confirmation Report No. 6	Montgomery Watson	March 1998
Stockpile and Post Remedial Excavation Confirmation Report No. 7	Montgomery Watson	March 1998
Stockpile and Post Remedial Excavation Confirmation Report No. 8	Montgomery Watson	March 1998
Stockpile and Post Remedial Excavation Confirmation Report No. 9	Montgomery Watson	March 1998
Stockpile and Post Remedial Excavation Confirmation Report No. 10	Montgomery Watson	March 1998
Stockpile and Post Remedial Excavation Confirmation Report No. 11	Montgomery Watson	April 1998
Soil Boring	Montgomery Watson	March 1998
Waste Discharge Monitoring Report No. 1	Montgomery Watson	November 1997
Import Soil Backfill Report No. 1	Montgomery Watson	November 1997
Soil Stockpile Report 1	Montgomery Watson	May 1997
Soil Stockpile Report 2	Montgomery Watson	May 1997
Post Remedial Excavation Confirmation Sample Report No. 1	Montgomery Watson	May 1997
Post Remedial Excavation Confirmation Sample Report No. 2	Montgomery Watson	May 1997